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Editorials

WHOM THE STATE WOULD DESTROY, IT FIRST MAKES DEPENDENT

SPEAKING FROM EXPERIENCE

For the most part, American doctors are determinedly opposed to this drive for socialized medicine, and I must say I am with them all the way. State medicine, in my opinion, bears disaster for doctor and patient alike. You cannot pipe out medicine to the community as you do with steam heat.

—Dr. A. J. Cronin,
English author of "The Citadel"

THE WOMAN SMOKER

In this year of grace, 1940, the woman smoker has become quite as accepted a part of the national landscape as the highway billboard. When an accident occurs as the result of impaired visibility on the highway, someone may protest violently and the billboard may be removed; meanwhile we drive merrily on and the matter is forgotten. Likewise the woman smoker now pursues her way peacefully unless her physician definitely forbids her this means of exercising her emancipation, and she excites not the slightest particle of notice.

Some may object to smoking on the ground that it is immoral, that it is a bad social habit, or that it is injurious to the health. Objections to smoking on the first count passed out with the dodo. Girls' schools that even a decade ago showed a cold shoulder to the student who felt that smoking was essential to her happiness now make haste to woo her with an attractive smoking room. The reason is simple. Principals, presidents and headmistresses discovered that girls *would* smoke on the sly, so they decided that executive sanction might rob the action of the thrill of enjoying forbidden sweets.

Removal of the taboo has brought to light some facts concerning smoking in our leading women's colleges. Questionnaires answered by Wellesley students showed that by 1937 smoking had increased from 53 to 70 per cent over 1930;

while at Bryn Mawr more than half of the student body smokes. Over 82 per cent, of the young women at Wellesley inhaled. Reasons for smoking included: pleasure, curiosity, friends did and social considerations.

Boiled down, we may say that the lid is off and advertising, insidious and effective, is having its day. Occasionally one finds a lone voice crying in the wilderness like Professor X — of a well-known Chicago institution of learning, who, single-handed, has made a number of firms back down on advertising statements by sheer presentation of scientific fact.

That smoking both among men and women is on the increase, no one will dispute. The average citizen simply accepts the situation without worrying about any possible ill effects, unless he is personally affected, and does nothing to combat the advertising propaganda to which we are subjected daily.

I decided to satisfy myself of the truth of the previous statement, so I wandered into the bookstore of one of the more liberal Protestant denominations which does publish pamphlets on such social evils as drinking and gambling. When casually approached as to whether any literature was published by them on smoking, although we were quite sure of our answer in advance, the young clerk replied in the negative. Then he turned to an older colleague and inquired how long it had been since their press had published anything on smoking.

"Not since I've been here," came the prompt reply. "Twenty years ago no minister I knew smoked; now I don't know one who doesn't."

This was probably a slight exaggeration, but it does demonstrate that smoking as a moral issue is passé.

A visit to one of the largest social service agencies in Chicago yielded exactly the same information. Consequently our youth, both boys and girls, are swallowing cigarette propaganda via the daily radio program unhindered by any other source of enlightenment.

A fine young man who is working with boys in a Chicago settlement assured us that the problem of smoking is being touched only in an extremely roundabout way. Usually each year some prominent athlete is called in to address the boys, and a nonsmoker is rather carefully selected. Through the small boy's hero worship he is indirectly led away from the use of cigarettes.

The female of the species has not even this dubious means of enlightenment provided her.

That smoking is a bad habit quite aside from possible harmful physical effects even many many smokers admit. We confess that we personally find it no worse in a woman than in a man. And we take our stand on the platform of sheer courtesy. One of our pet annoyances is having a total stranger deliberately blow his cigarette smoke in our face and then try to strike up an acquaintance by solicitously inquiring whether I am allergic to his particular brand of tobacco — be it Turkish, Egyptian or otherwise. The possible nicotine content of his cigarette does not enter into my wrath of the moment.

A masculine smoker of our acquaintance criticizes women smokers on two counts: first, because they smoke to excess and second, for the simple reason that he just can't stand the way some women look smoking in a restaurant. Both criticisms we believe are valid. We once had a woman professor who we are sure would have discontinued the practice if she had ever watched herself smoke in a mirror. Her lack of grace was matched only by the zeal with which she puffed away.

Nor do we believe that the definition of *magician* as "a man who makes your parlor rug into an ash tray" can be exclusively applied to the male. Too many hotel managers have testified to the havoc wreaked on hotel furniture by feminine patrons. Many a hostess has had the experience of finding holes burned in her best linen by a thoughtless feminine guest. Not to mention the number of commuters who could probably repeat our experience of a frayed spot in our best coat caused by a carelessly held cigarette. No wonder the harrassed hostess has had to call in the aid of Emily Post! If smoke we must, let there at least be some etiquette about it.

People simply will not cut down on smoking unless it can be proved to be injurious to the health — and frequently not even then. Here is where it is up to the medical profession to assume responsibility. After scanning some forty articles appearing during the past year and a half in medical publications alone — which I estimate to be about one-third of the number to be found in current periodical literature of all types — we have come to the conclusion that a

sincere effort is being made to determine whether cigarette advertisers shall have the last word. Medical literature is extensive and expresses a wide variety of opinion.

One angle intrigued us. Medical research in its published results has in general made no distinction between men and women patients. Therefore we may apply findings equally to both.

An interesting fact was brought out at Washington University, where an elaborate machine for measuring the volume of smoke of the average puff on a cigarette was invented. The total volume of respiration was determined to be 500 cc., while the volume per puff ranged between 25cc and 40cc. Some of the higher volumes were recorded among the women. Because of various smoking habits it has been pointed out that the nicotine content in tobacco has no strict relation to the amount appearing in the smoke. Therefore the interest in the amount of smoke inhaled.

One differentiation between men and women smokers recorded in the medical literature we perused occurred in the matter of taste preference. Donald A. Laird[1] tested 150 subjects for reactions to tartness of fruit juice. Smoking made no difference in the preference curves for men in either age group or for the women in the 20 to 40 age group. Older women who smoked showed a predilection for tartness, from which Laird facetiously concluded that the proper gift for a smoking grandmother was not a box of candy but a jar of pickles.

While it is well known that cancer of the mouth, lips, tongue, larynx, pharynx, etc. is more prevalent in smokers than nonsmokers, strangely enough the increase in the number of women smokers has not been paralleled by a corresponding increase in the incidence of cancer of the mouth and adjacent regions in women.

The effects of smoking upon pregnant women are still being debated. The truth probably lies midway between affirmations that it is disastrous and the statement that melancholy tales about extreme ill effects of smoking upon women and their babes are largely mythical. The obstetrician who remarked that he dreaded handling the case of a society woman who smoked to excess doubtless reflected the sentiments of many of his colleagues.

A reexamination of the effects of cigarette smoking upon the human body, as seen by the medical profession today, may prove worthwhile, especially in view of the fact that in 1931 inhabitants of these United States smoked an estimated 119,653,000,000 cigarettes a year, of which women of 35 or less were said to have consumed 16,940,000,000. Today's figures would show an even larger percentage of women smokers. What are the charges laid at the door of the cigarette, and just how seriously shall we take them?

Minor symptoms reported by habitual smokers in a recent experiment include a dry or irritated throat, husky or hoarse voice, excess secretion, mucus, stuffiness and dryness of the nose, sneezing, coughing, tickling of the throat, burning of the tongue, "dopey" feeling, burning and fatigue of the eyes, bad taste, nervousness and loss of appetite. The total number of symptoms was higher for a heavy smoker as we might expect.

Cigarettes might be and probably are the source of arsenic and lead poisoning in some individuals. However it is the nicotine content with which most experimenters have busied themselves. The nicotine content of one cigarette is 3.3 mgs.; even if 70 per cent is removed, 1 mg. is retained.

Among the effects of tobacco poisoning are: ambliopia, tinnitus aurium, nerve type deafness, tendency to heartburn, symptoms simulating duodenal ulcer, contact ulcers, vasospasm and cardiac irregularity. In the gastric function it causes a rise in secretion and inhibits hunger. On the intestines, x-ray studies have shown colonic hyperirritability which produces either diarrhea or spastic constipation. Many tobacco buyers and workers are known to be subject to eczema and other erythematous or maculopapulary rashes when handling certain tobaccos.

Charles B. Hollis[2] truly points out that smoking has become so universal and the so-called tobacco cough so common that physicians have never generally accepted it as a pathologic entity. "I wonder," Hollis says, "how many millions of cases of permanent physical or mental change could be tabulated, if we were all tobacco conscious to the degree of recognition of this situation when we see it."

1. Laird, Donald A.: The Effect of Smoking on Taste Preferences, M. Rec. 149:404, June 21, 1939.

2. Hollis, Charles B.: A Consideration of Certain Respiratory Phenomena Resulting from the Use of Tobacco, Dis. of Chest 5: 8-13.

The main reasons for the infrequency of serious poisoning are that the percentage of nicotine in tobacco is too small to make it easy to get a fatal dose from the ingestion or the inhalation of its smoke, and that nausea and vomiting are early symptoms which ordinarily prevent further absorption of the drug.

The effects of nicotine upon longevity are fairly generally accepted. Raymond Pearl's studies indicated that even moderate smoking decreased the life span, while heavy smokers have a much poorer life expectancy than heavy drinkers. The findings of James J. Short, Harry J. Johnson and Harold A. Ley,[3] based on questionnaires to an unselected group of 2031 insurance policy holders, which were obtained independently of physical examinations, indicate a trend in accordance with Pearl's report, who found increased mortality among heavy smokers.

What, if any, is the reaction of the throat and lungs to cigarette smoke? Ballenger[4] insists that he is unable to pick out a "smoker's throat."

He concludes that no definite relationship exists between the enlargement of the lymphatic tissue of the pharynx and the number of cigarettes smoked per day and says that local effects of cigarette smoke on mouth, throat and nose are debatable. On the other hand he disputes the claim that any certain hygroscopic agent is less irritating than another. He found no significant difference in irritation between cigarettes treated with diethylene glycol, those moistened with glycerin and cigarettes containing no hygroscopic agent. When he found irritation present, it was not sufficiently marked to justify definite conclusions. To eliminate possibilities of error, he used three lots of cigarettes made by one manufacturer of the same batch of tobacco.

A prominent roentgenologist to whom Charles Hollis had sent a patient remarked that although one does not see the phrase in textbooks, he has learned to appreciate an appearance of chest x-rays to which he refers as "tobacco lungs." Such testimony would indicate that tobacco damage to the lower respiratory tract can be demonstrated upon x-ray plates.

Hollis continues, "I maintain that there is much evidence to support an opinion that the mucous membrane effects are probably secondary to the many and often repeated shocks resulting from either atopic or acquired sensitivity to the combustion products of tobacco smoking, or to direct drug action, which lead to varying degrees of tissue changes. I have been unable to find any literature bearing upon favorable results with the use of prepared tobacco antigens for respiratory tract manifestations, although they are used with great satisfaction in the eczemas seen in tobacco handlers."[5]

In certain individuals with coronary disease the use of tobacco has been known to precipitate or aggravate angina pectoris. Whether or not tobacco leads to permanent changes in coronary vessels has been a matter of controversy. B. J. Birk and H. H. Huber cite 3 cases of angina pectoris caused by tobacco smoking (one in a woman). Prior to the cessation of smoking, definitely abnormal electrocardiographic changes were found. When the causative factor was removed, the electrocardiograms returned to normal.

Harry J. Johnson[7] studied the electrocardiograms of 2,400 apparently healthy males to determine the effect of smoking on coronary heart disease. Two groups were used: those who admitted to smoking continuously for more than ten years and those who had never used tobacco. He found a 50 per cent increase in abnormal electrocardiac observations among the smokers as compared with the nonsmokers. This would seem to indicate that smoking does play some part in the subsequent development of abnormal electrocardiac changes. More significant is the fact that the nonsmokers were an older group averaging 48.5 years, as compared with 47 years for the smokers. Besides the incidence of overweight was slightly higher in the nonsmoking group.

Studies have shown that there is considerable individual variation in toleration to tobacco as it affects the alimentary tract. In view of the development of some tolerance to tobacco, it is not surprising that many chronic smokers manifest no significant changes in the activities of the

3. Short, James J., Johnson, Harry J., Ley, Harold A.: The Effects of Tobacco Smoking on Health, J. Lab. & Clin. Med. 24: 586-89, Mar., 1939.

4. Ballenger, Howard C.: Irritation of the Throat from Cigaret Smoke, Arch. of Otolar. 29: 115-123, January, 1939.

5. Hollis, Charles B.: op. cit.

6. Birk, B. J. and Huber, H. H.: Angina Pectoris and Tobacco Smoking, Wis. M. J. 38: 733-735, 1939.

7. Johnson, Harry J.: A Study of 2,400 Electrocardiograms of Apparently Healthy Males, J.A.M.A. 114: 561-63, 1940.

stomach and colon. When the limit of tolerance is approached, one would expect these organs to be influenced. In most subjects, smoking reflexly stimulates the secretion of saliva. Acutely toxic doses of tobacco or nicotine do provoke vomiting or diarrhea. Only in an occasional patient does smoking tend to cause significant gastric retention and an increase in acidity, although smokers have a tendency to hyperacidity more often than nonsmokers. Only when marked alterations in blood pressure occur does smoking affect the secretion of bile and pancreatic juice.

Three experimental patients of Schnedorf and Ivy[8] collapsed after smoking on an empty stomach, indicating that the effect of smoking on the cardiovascular system of some subjects may be sufficient to produce gastrointestinal disturbances.

Patients with stomach or intestinal ulcer are generally warned not to smoke to preclude irritating the ulcers. Not much evidence has been brought forward to support the necessity for this admonition, although abstinence from tobacco is thought by some physicians to be chiefly responsible for the alleviation of peptic ulcer.

As early as 1912 it was known that injections of nicotine would increase an animal's secretion of adrenalin. This raises the blood sugar level. E. A. Hines, Jr. and Grace M. Roth of the Mayo Clinic found that smoking raises blood pressure in both normal persons and those suffering with high blood pressure.

That there is some protein or some undetermined constituent of tobacco or its smoke to which certain people are allergic has been proven by a number of published studies. Peshkin and Landay[9] showed that a striking parallelism exists between cutaneous reactions to tobacco and those to pollen. This reaction was specific and transferable passively. His study was based on 200 afebrile nonallergic children and 164 allergic children. Sex played no role in the incidence of reactions in the various groups tested. Of the nonallergic children, 17.5 per cent reacted to tobacco. Of the 164 allergic children, 69.5 per cent reacted to tobacco.

Often the high frequency of cancer of the lips, tongue and throat in men as compared with women has been attributed to persistent irritation of the epithelial surfaces by tobacco tar. In contrast to the findings of Roffo, who succeeded in producing a large number of papillomas and true malignant growths after continued application of coal tar, is the report of Kanematsu Sugiura.[10]

Sugiura painted the skins of mice with combustion products of tobacco distilled over at temperatures between 100 and 900 degrees Centigrade. He produced but a single instance of squamous carcinoma among 168 Bagg albino mice that lived from 90 to 500 days. No cancerous change was produced by painting the skins of C57 black and dba mice, as well as the ears of rats of Wistar Institute and rabbits of common stock.

It has been held by some doctors that the tar in cigarette smoke could account for lung cancer. Other doctors deny this insofar as smoke is concerned. At present there is little evidence of either a positive or negative nature.

Sulzberger[11] states that some cases of certain diseases of the vascular system (thromboangiitis obliterans, angina pectoris, coronary disease), clinically long considered to be in some way connected with smoking, are manifestations of hypersensitivity in certain segments of blood vessels to circulating allergens derived from or contained in tobacco.

Whether or not an actual causal relation between tobacco and thromboangiitis obliterans can ever be established, it is an absolute necessity in the management of this disease to avoid the use of tobacco completely. The use of patented filters and the so-called denicotinized cigarettes must likewise be prohibited, as there is at present voluminous proof that the filtering and denicotinizing processes are not adequate to prevent the vasospasm associated with smoking.

It has been fairly well established that smoking does cause peripheral vasoconstriction, as indicated both by lowering of skin temperature and plethysmographic measurements showing diminished blood flow.

8. Schnedorf, J. G. and Ivy, A. C.: The Effect of Tobacco Smoking on the Alimentary Tract, J.A.M.A. 112: 898-904, 1939.

9. Pashkin, M. Murray and Landay, L. H.: Cutaneous Reactions to Tobacco Antigen in Allergic and Nonallergic Children, Am. J. Dis. Child. 57: 1288-1309, June 1939.

10. Sugiura, Kanematsu: Observations on Animals Painted with Tobacco Tar, Am. J. Cancer 38:41-49, Jan., 1940.

11. Sulzberger, Marion B.: Recent Immunological Experiments in Tobacco Hypersensitivity, Bull. N. Y. Acad. Med. 9:294, 1933.

Abramson, Zazeela and Oppenheimer[12] observed the effect of smoking in a series of normal subjects and in a series of patients suffering from different peripheral vascular disorders. They found that a maximal response to smoking was elicited only in an extremity in which the blood vessels were neither excessively dilated nor constricted. The greatest decrease in blood flow occurred in the hand. The changes were less marked in the foot and leg, and there was no change in the forearm.

On the basis of the observations of Grant and Pearson, the experimenters assumed that local blood flow changes in the hand were dependent to a considerable degree upon alterations in the caliber of cutaneous blood vessels, whereas in the forearm the muscle vessels play the dominant role. If these assumptions are correct and if the muscle of the forearm can be representative of similar tissue elsewhere at the periphery, then the statement can tentatively be made that smoking causes constriction of the arteries in the skin, but apparently has little, if any, effect upon those in the voluntary muscle.

Judging from these results, it would seem that the usual statement that smoking causes a decrease in peripheral blood flow should be modified to indicate that the decrease probably takes place only in the blood vessels of the skin, and not in the voluntary muscle. Constrictor response to smoking observed in the hand cannot be considered as typical of reactions of blood vessels elsewhere in the body.

Characteristic effects which have been observed on the pulse, blood pressure, peripheral skin temperature and blood sugar as a result of tobacco smoking can be explained by an increased output of epinephrine. This is probably the result of a stimulating effect of nicotine upon the sympathetico-adrenal system.

Many observers have demonstrated that one to three cigarettes diminish skin temperature as much as 10 degrees Fahrenheit. Thirty minutes are usually required to return to normal skin temperature.

Chronic smoking by affecting nerves, heart, circulatory system, adrenal gland and blood sugar level can produce fatigue. Work published nearly 20 years ago showed that brain workers who smoked had less ability to respond to an increasing work load as the day wore on. In the case of athletes, reports show that the use of tobacco has a little adverse effect on endurance. In late 1938 a physician reported on six cases of extreme fatigue, some male and some female, in which all forms of treatment proved unavailing until he told his patients to stop smoking.

Should this rather thorough inventory of possible evils of smoking affect our attitude toward it? As someone has pointed out, the foregoing symptoms don't all occur at the same time, and a single minor difficulty is companionable. Albert Ingalls[13] says that the real harm the practice does a few and the small harm it does the rest is only a minor charge against our enjoyment. And Walter L. Mendenhall of the Boston University School of Medicine opines that life without a little cussedness is pretty tame.

Broadly speaking, it cannot be said that smoking with moderation has any marked deleterious effects on people in sound health. The danger lies in the degree. Ordinarily, the pleasure derived undoubtedly overbalances the possible harm.

On the other hand there is merit in sitting down occasionally and facing facts. Smoking *may* be the cause of that let-down feeling, if you have been smoking to excess, in which case cutting down is indicated.

To return to the woman smoker, from the medical standpoint she seems to be little worse off than her masculine partner in enjoyment. We cannot refrain from pointing out that most of the well-founded criticism of smoking has been gained at the expense of the cigarette — and by the same token, of the woman smoker. Men still retain the solace of a pipe or the comfort of a cigar unmolested by the barbed arrows of the medical researchers.

12. Abramson, David I., Zazeela, Herman and Oppenheimer, B.S.: Plethysmographic Studies of Peripheral Blood Flow in Man. III. Effect of Smoking upon the Vascular Beds in the Hand, Forearm and Foot, Am. Heart J. 17: 194-205, 1939.

13. Ingalls, Albert E.: If You Smoke, Sci. Am. 154:310-313, Je., 1936.

HOW THE DOCTORS INCOME IS DISTRIBUTED

Medical Economics, the business magazine of the medical profession says:

Of every dollar collected by the average American physician from his patients, 40 cents is paid out in the form of rent, secretarial salaries, automobile upkeep, drugs, supplies, equipment,

and other professional expenses, according to reports received from 7,707 physicians by *Medical Economics*, the business magazine of the medical profession.

The actual amount spent for professional expenses averages $2,963 per physician per year. (Annual gross income averages $7,365.) As a result of these substantial expenditures, the average private physician has an accumulated investment in professional equipment of $3,231.

A LOWER BIRTH RATE

The United States birth rate dipped slightly last year after rising in 1937 and 1938, according to preliminary tabulations of the Census Bureau, Department of Commerce.

A total of 22,262,726 births occurred last year, resulting in a birth rate of 17.4 births per each 1,000 estimated population. In 1938, the birth rate was 17.6, based on 2,286,962 births. The rate in 1937 was 17.0.

The preliminary 1939 rate is approximately 5 percent higher than the lowest birth rate recorded in the history of the birth registration area established by the Census Bureau in 1915. The low point was in 1933 when the rate was 16.5. Census officials cautioned that the slight increase reported in recent years cannot be taken as assurance that the gradual decline of the birth rate has been checked.

New Mexico, with a rate of 33.7, had the highest birth rate reported last year. Other states with high birth rates were Arizona, 26.0, Mississippi, 25.6, and Utah, 25.1.

The lowest preliminary rate reported last year was New Jersey where the rate was 13.0. Other states that had low birth rates were Connecticut, 13.5, Massachusetts, 13.6, and New York, 14.4.

Sixteen states and the District of Columbia showed an increase in the birth rate last year over 1938. A decrease during the same period was reported by twenty-seven states, and in five states there was no change. Greatest increases in the birth rate were reported for the District of Columbia, Delaware, Florida, and South Carolina. Largest decreases were shown in Mississippi, Arkansas, and Illinois.

The patient has no more right to all the truth than he has to all the medicine in your saddle-bag. He should get only so much as is good for him.—Oliver Wendell Holmes.

ALCOHOLICS ANONYMOUS

In February of this year we published an article in this Journal describing a new approach to the problem of the chronic alcoholic.

This approach was started by the alcoholics themselves. The group is called "Alcoholics Anonymous." These alcoholics realized the utter hopelessness of their condition. All of them had been in sanitoria, and many of them had been confined to institutions for the insane. They recognized their addiction to be a disease which medicines alone were unable to cure. They also realized that by themselves they were unable to break the hold alcoholic had upon them.

The chronic alcoholic has lost his friends by his drinking. He feels that no one — not even his family — understands his plight. He is truly alone — and finds solace and companionship only in his bottle. Most chronic alcoholics really want to stop. When they openly admit this, and are willing to let others help, then the members of Alcoholic Anonymous can enter the picture.

The chronic alcoholic in talking to a member of the group finds a person who "understands," for this person has had the same experiences.

The new member is introduced to the fellowship of the group. "Business" gatherings are held weekly to talk over common problems. "Social" gatherings are held several other nights of the week where companionship is sincere and bridge, poker and conversation abound.

There are no officers in the group. Each member has equal standing. There are no fees, dues, nor expenses whatsoever.

When a new member has become thoroughly acquainted with the meaning of his new life he should go out himself and work with other unfortunates.

This giving of himself, without thought of remuneration, gives him strength to combat his own desire.

It is indeed a miracle when a person who for years has been more or less constantly under the influence of alcohol and in whom his friends have lost all confidence, will sit up all night with a "drunk" and at stated intervals administer a small amount of liquor in accordance with a doctor's order without taking a drop himself.

Full cooperation is given to the medical pro-

fession. In dealing with patients who are ill the family physician is called in who assumes charge until the patient has recovered.

About 6 years ago "Alcoholics Anonymous" was started in New York. The group gained headway slowly, but now there are about 1000 members with groups in nearly every large city.

The first member in Chicago joined the group in Akron, Ohio 3 years ago. One year ago Chicago had 8 members; now there are 150 and the group grows daily.

Of alcoholics who are contacted about 80% join "Alcoholics Anonymous." Of the first 40 to join the Chicago group 23 have not tasted alcohol since being admitted. This covers a period of time of from 6 months to 3 years. Eleven have had one "slip." Three have had from 2 to 4 "slips" and three have been lost.

A new member may feel so well physically and so strong mentally that in his found condition he may believe he can drink moderately as many people do. In trying to do so he rediscovers his complete lack of power to combat this disease. After such an experience he usually remains firmly attached to his new found haven.

It seems unbelievable, when one considers that in people who were "hopeless alcoholics," 58% have attained complete sobriety and 92% practical sobriety.

Broken minds and bodies that have been a heavy weight on society have been rehabilitated. Broken homes have been restored — innocent families no longer suffer.

A movement that is strong enough to make rehabilitated men, some of high position and great wealth, give of themselves to help restore other broken lives without thought of remuneration, is indeed a powerful thing, worthy of our attention.

Further information may be had by addressing this Journal.

IN MEMORIAM

DR. CHARLES EDWARD HUMISTON

Dr. Charles E. Humiston, surgeon and medical educator of national repute, was born in Washington County, Ohio, March 17, 1868. He was graduated from the University of Illinois medical school in 1896, practicing in Chicago until his death, which occurred on November 4, 1940. He is survived by his widow, Myrtle Wheeler Humiston; two sons, four daughters, ten grandchildren and two sisters;

Medicine has rarely, if ever, been better exemplified as a ministry to mankind than in the full and servicable life of Dr. Charles E. Humiston.

Dr. Humiston was a physician in every sense of the word. He ministered to man's physical ills; he ministered to his community's health and material advancement; he ministered to

Charles Edward Humiston, M. D.

men's souls in trying times and hours when they needed more than all else encouragement, understanding, sustenance which came of another man's strength of character no less than in his innate generosity.

Dr. Humiston, from his childhood, loved learning for learning's sake; much more he loved learning for the place it gave him among the elect; most he loved learning for what power of control it gave him over pain, sickness and death.

Dr. Humiston made his own way. He worked with his hands for the wherewithal to train his mind, that he might work with his mind for the wherewithal to further train his mind and his

hands for his great vocation of practitioner and teacher of medicine.

Dr. Humiston held several teaching positions. From 1905 until his retirement a few years ago, he was Professor of Surgery in the University of Illinois. Formerly on the staff of the Chicago State Hospital and for 18 years he was attending surgeon at Cook County Hospital. He was also prominent in the founding and development of the West Suburban Hospital, of which he was the first president, 1911 to 1914; a director and trustee and member of the surgical staff for many years.

Dr. Humiston's remarkable abilities were also at the disposal of many professional organizations. He was a former president, Illinois State Medical Society, past president and secretary of the Chicago Medical Society; for three decades he served as a delegate to the Illinois State Medical Society; he was a member of the house of delegates of the American Medical Association 1915 — 1916 — 1918 — 1919 and from 1921 to the special session of 1935; in 1930 was appointed to the American Medical Association council on medical education and hospitals serving until 1937.

In 1922, Dr. Humiston was awarded the honorary degree of Doctor of Science from Marietta College (Ohio). Among his recent honors was an emeritus membership in the Illinois State Medical Society, of which he had been a member for 35 years.

Dr. Humiston's scientific articles appeared in numerous medical publications. He was also coauthor with Frederick W. Peabody of Boston and Woodbridge Riley of Vassar of "The Faith, the Falsity and the Failure of Christian Science."

In the field of medical education Dr. Humiston was a leader. He was active in raising the standards of the Illinois Board of Registration. The present Medical Practice Act of the state of Illinois is very largely due to his efforts. Without his faithful attention in combatting the numerous legal obstacles, from the insighting of the bill by him in the lower courts, the best state medical law in the country would have failed. His zeal and consecration of purpose was dramatically rewarded a few years ago by the decree of the Supreme Court of Illinois which forbade the practice of medicine by corporation in that state.

For more than twenty years Dr. Humiston was interested in public health matters and was known as an uncompromising opponent of all forms of quackery. He sacrificed an incredible amount of time, energy and money in the promotion and development of medical organizations, not only in Illinois but throughout the nation. He was an ardent advocate of hospital standardization by the American Medical Association, opposing all interference by any and all other self-appointed standardizing groups of every kind and character.

Dr. Humiston also took a leading part in the fight against the Sheppard-Towner and Harrison Narcotic Acts, appearing personally on July 18, 1921 in opposition to the original Sheppard-Towner Bill before the Committee on Interstate and Foreign Commerce in Washington, D. C.

Dr. Humiston was a competent executive, endowed with wisdom and courage. He was a man of enlightenment who thought in terms of nationality rather than personality, his assiduous labor in behalf of medicine was not limited to the boundaries of states, but by those of the America whose historic ideals he upheld. He was constantly in touch and in sympathy with the aims and needs of the profession as witnessed by his unremitting fight against lay interference and dictation in the practice of medicine.

Physicians and citizens of Illinois will best remember Dr. Humiston because of his high and noble character. Friend and foe respected him. The fact that he had been a real leader in medical advancement for a period of forty years is ample testimony of the strength of character and the high esteem in which he was held by his fellow men. His passing is a loss to us all.

PAPERS FOR THE 1941 ANNUAL MEETING

The 1941 annual meeting of the Illinois State Medical Society will be held at the Palmer House, Chicago, on May 20, 21, 22, 1941. The Committee on Scientific Work, composed of the officers of the various scientific sections, with officers of the Society, recently met in Chicago to make tentative plans for the scientific programs to be presented at the 1941 meeting. It is proposed to arrange schedules for three full days, instead of closing the annual meeting at noon Thursday, as has been the custom in recent years.

In accordance with the plans for the Centen-

nial Meeting held last May in Peoria, it is proposed to again schedule more general or joint sessions with all sections participating, and to have a general meeting on Tuesday evening in place of the Stag Entertainment as presented in the past.

Any member of the Illinois State Medical Society who desires to present a paper before any of the section is requested to write to the officers of the proper section as early as possible, giving the title of the paper desired to be presented and also a short synopsis of the paper. Owing to the fact that the number of papers to be presented before the section groups individually, those responsible for the arrangement of programs will be compelled to select only those papers which in their judgment will be of greatest general interest to all members. They must necessarily be critical in making their selections.

OFFICERS OF SCIENTIFIC SECTIONS

Section on Medicine
W. O. Thompson, Chairman ..... 700 North Michigan Avenue, Chicago.
F. Garm Norbury, Secretary ..... Jacksonville.

Section on Surgery
Charles L. Patton, Chairman ..... Springfield.
Loyal Davis, Secretary ..... 54 East Erie Street, Chicago.

Section on Eye, Ear, Nose and Throat
Thomas D. Allen, Chairman ..... 122 South Michigan Avenue, Chicago.
Clifton Turner, Secretary ..... Peoria.

Section on Public Health and Hygiene
N. O. Gunderson, Chairman ..... Rockford.
Walter C. Earle, Secretary ..... Champaign.

Section on Radiology
Harry W. Ackemann, Chairman ..... Rockford.
E. E. Barth, Secretary ..... 303 East Superior Street, Chicago.

Section on Pediatrics
Orville E. Barbour, Chairman ..... Peoria.
Craig D. Butler, Secretary ..... 715 Lake Street, Oak Park.

Section on Obstetrics and Gynecology
Herbert E. Schmitz, Chairman ..... 25 E. Washington Street, Chicago.
Milton E. Bitter, Secretary ..... Quincy.

The matter of selecting speakers to present papers before any sections is left to the officers of the individual sections, while those to appear at joint sessions will be selected by the officers for these sessions, as follows:

W. O. Thompson, Chairman ..... 700 N. Michigan Avenue, Chicago.
Loyal Davis, Vice Chairman ..... 54 East Erie Street, Chicago.
Craig D. Butler, Secretary ..... 715 Lake Street, Oak Park.

The preliminary program for the 1941 annual meeting will be published in the April number of the ILLINOIS MEDICAL JOURNAL, while the official program will appear in the May number. This means that the officers of sections are desirous of scheduling papers as early as possible and all members desiring to appear on any of the programs should write to the proper officials at the earliest possible moment.

ILLINOIS STATE MEDICAL SOCIETY COMMITTEE ON MEDICAL BENEVOLENCE

The House of Delegates of the Illinois State Medical Society at its Annual Meeting held May 21-22-23, 1940, *voted that certain changes be made in the Constitution and By-Laws to enable the Society to establish a Benevolent Fund for indigent physicians and their widows.*

The plan adopted very closely resembles the one which has been operating in Pennsylvania for the past thirty-seven years.

We are publishing herewith the personnel of the Committee together with an outline of the purposes and the power given the Committee to carry on this work.

Committee on Medical Benevolence, John S. Nagel, Chairman 185 N. Wabash, Chicago, Ill. Charles H. Hulick, Shelbyville; Clarence H. Boswell, Rockford.

PURPOSES OF THE COMMITTEE

1. To create a Benevolence Fund:
   a. Through allocation of $1.00 each year from dues of each member.
   b. Through gratuities, endowments, etc.
   c. Through the efforts of the Women's Auxiliary to the Illinois State Medical Society.

2. To investigate cases of alleged financial difficulties on the part of members, their widows or widowers.

3. When found worthy, to appropriate regular monthly benefits not to exceed $25.00 to $30.00 per month in any one case. When deemed advisable, may appropriate more over a short period of time when rehabilitation seems probable.

4. To designate the component society secretary in each county as the county chairman to

submit applications from members for benefits, then to see that a questionnaire form is properly executed to give the desired information relative to the case. The Councilor of the District may assist the Committee in submitting names of members, their widows or widowers, when he believes the individual is entitled to the benefits herein prescribed.

5. When it is the opinion of the Committee that the case is a worthy one and benefits should be allowed, the Chairman of the Committee should notify the Secretary of the State Medical Society, stating the amount agreed upon as the regular allowance, stating the intervals at which the benefits shall be paid, so that proper vouchers may be submitted.

THE INVESTIGATIONS

When it is reported to the Committee that a member, widow or widower of a member is needy and unable to secure the necessities of life, a questionnaire form shall be submitted from the Secretary's office asking for the following information:

1. A brief social history of the applicant, past and present. Data concerning reasons for being in want whenever possible, and all other pertinent information which will enable the Committee to take the proper action.

2. A brief financial history including present assets and income, sources and amount.

3. Disbursing of present resources (rent, food, clothing, etc.).

4. Statements as to probable permanency of the present distress.

5. Any possible sources of assistance such as:
   a. Relatives .....
   b. Friends .....
   c. Fraternal Organizations .....
   d. Insurance .....
   e. Pensions .....

6. Have all sources of help been solicited?

7. Additional information. Means by which influence might be exerted to find employment or some other source of income. Is there a possibility of rehabilitation? (With moderate financial assistance over a short period of time, would it be possible for the applicant to become self-supporting?)

PROCEDURE

Requests from members, their widows or widowers for assistance, if submitted to the Secretary, shall be referred to the Committee promptly. At the same time a questionnaire form will be submitted to the applicant or to the county society secretary, or to the Councilor if the information is submitted by him. All possible information which will aid the Committee in determining the eligibility for assistance, the amount actually needed, or if rehabilitation through short time payments is probable, should be submitted promptly.

Each case will receive the proper consideration by the entire committee which shall pass final judgment on:

1. Eligibility for aid.
2. The amount of aid.
3. Whether for a short time or permanently.

The decision of the Committee shall be final and there will be no higher authority within the Society to whom appeals from decisions of the Committee can be referred.

In the event that additional income is received and the individual is no longer eligible for further benefits, the county society secretary or the Councilor submitted the data, should notify the Committee of these facts promptly.

As soon as a reasonable amount is accumulated in the Benevolence Fund, only the income from the Fund shall be used to pay benefits.

The Medical Benevolence Fund shall be subject to an annual audit as are other funds of the Illinois State Medical Society, although merely the amount of the Fund, the payments made during the year, the additions to the Fund, and the interest from investments shall be mentioned. The names of beneficiaries shall not appear in the annual audit, nor shall they be mentioned in the annual report of the Committee to the House of Delegates.

The Secretary of the State Medical Society shall maintain a separate file for all correspondence relative to beneficiaries, amounts paid, investigations and minutes of meetings of the Committee, which shall be a closed file and not open to inspection by others than members of the Committee, the Auditor, or a regularly designated Committee of the House of Delegates.

As the regular vouchers of the Illinois State Medical Society are paid through the State Bank and Trust Company of Evanston, all funds for

benevolence purposes shall be maintained in another bank and payments for benevolence purposes shall constitute the only vouchers drawn on these funds. The council of the Illinois State Medical Society has allocated the sum of $5,000.00 maintained in the National Bank of Monmouth for several years as a Certificate of Deposit, as the nucleus for the Benevolence Fund, and payments shall be made from this fund on this bank.

NOTE: The above report and procedure was presented to the Council of the Illinois State Medical Society in regular session on August 4, 1940, by the Chairman of the Committee on Medical Benevolence. The report and procedure were approved, and the Committee instructed to make the necessary arrangements to function immediately. The Council was authorized by the House of Delegates at the 1940 annual meeting to approve a method of procedure so that the work could be started with a minimum amount of delay.

AMERICAN BOARD OF OBSTETRICS AND GYNECOLOGY

The written examination and review of case histories (Part I) for Group B candidates will be held in the various cities of the United States and Canada on Saturday, January 4, 1941, at 2:00 P.M. Formal notice of the place of examination will be sent each candidate several weeks in advance of the examination date. No candidate will be admitted to examination whose examination fee has not been paid at the Secretary's Office. Candidates who successfully complete the Part I examination proceed automatically to the Part II examination to be held in June 1941.

The general oral and pathological examinations (Part II) for all candidates (Groups A and B) will be conducted by the entire Board, meeting at Cleveland, Ohio, from May 28 to June 1, 1941, immediately prior to the opening of the annual meeting of the American Medical Association.

Application for admission to Group A, (Part II) examinations must be on file in the Secretary's Office not later than March 15, 1941.

After January 1, 1942, there will be only one classification of candidates, and all will be required to take the Part I and Part II examinations.

The Board wishes to announce a modification of the case record ruling (effective January 1, 1942) as it appears in the September 1940 issue of the Board booklet. This ruling should read: "It is preferable that the number of cases submitted should not be more than half (25) of the total number of fifty (50) cases required."

For further information and application blanks, address Dr. Paul Titus, Secretary, 1015 Highland Building, Pittsburgh (6), Pennsylvania.

NUMBER OF SUICIDES DOUBLED IN 18 YEARS

More than twice as many persons commit suicide nowadays as did in 1920, U. S. Census Bureau figures just released for the 18-year period 1920-1938 show.

The Census Bureau does not tell why. It is their job to report the figures.

Total number of suicides in the registration area of the United States for the year 1938, latest figures available was 19,802. For the year 1920 it was 8,959. For the entire period, the nation's total of suicides was 300,580.

The rate for 1938, 15.2 per 100,000 estimated population, was the highest since the depression period, when the all-time high rate of 17.4 per 100,000 was recorded in 1932.

Of the States, Nevada reported the highest suicide rate per 100,000 estimated population in 1938 with 35.6; South Carolina reported the lowest rate with 6.7. In total number of suicides in 1938, New York led all the States with 2,248, while Nevada reported the smallest number with 36 suicides. California ranked second in total number of suicides in 1938 with 1,874; Pennsylvania third with 1,397; Ohio fourth with 1,274; and Illinois fifth with 1,271 suicidal deaths.

The story is the same all along the line. The amount of sickness in insured countries, the number of working days lost annually as a result, the mortality from preventable diseases, all compare unfavorably with the health statistics of the United States.—*The New York Medical Week.*

Institutional care is always necessary at one time or another in treating tuberculosis, because of communicability. There is a considerable class which may be regarded as custodial cases, and there is need for domiciliary institutions where they can be cared for. When returned to the community results are often disastrous to them and their families. After-care and vocational rehabilitation are essential in restoring the patient to normal life. Masur, J., Hosp. Management, Oct., 1939.

"JEST A MINUTE"

A banker friend of a friend of ours is a victim of occasional rheumatic attacks. He was saying to an acquaintance he wished he knew how to avoid getting stiff in the joints. "Stay out of them," the other advised.

"I understand," said a friend once to a doctor, "that Green is a martyr to chronic indigestion."

"No," replied the doctor, "he has indigestion all right, but it is his wife who is the martyr."—Southern Medicine and Surgery.

MEDICAL ECONOMICS

H. M. Camp, M. D.
E. P. Coleman, M. D.
J. H. Hutton, M. D.
Ralph Peairs, M. D.
R. K. Packard, M. D.

Edited by the Committee on Medical Economics
of the
Illinois State Medical Society
E. S. Hamilton, M. D., Chairman
Kankakee, Illinois
Address all letters and communications to the Chairman.

C. H. Phifer, M. D.
C. B. Reed, M. D.
C. B. Ripley, M. D.
C. E. Wilkinson, M. D.
W. M. Hartman, M. D.

There is little question that the majority of the physicians of Illinois were disappointed in the results of the last national election. Proposed changes in the practice of medicine, originating at Washington during the past seven years, had aroused fears that even more drastic changes were contemplated. The majority of medical men did not desire such changes, and were in favor of that party which had come out definitely against any change. However, President Roosevelt in one of his campaign speeches stated that he did not feel that compulsory health insurance was an necessary item in the economic future of our people, and that the people had confidence in the progressive medical profession of America. This was and is quite encouraging to members of the medical profession, who have been and still are most apprehensive over their future. We can only have confidence in the promises and words of the President and assure him that we will cooperate with the Government in all possible ways for the good of our country. We must not criticize and obstruct, but aid and assist at all times. He is our President and Congress is our Congress.

This does not mean that we can sit back complacently and fail to take interest in our Government. Instead, we must be more interested and alert than we have ever been in the past. We must be acquainted and conversant with what is going on in Washington and must let our Senators and Congressmen know of both our knowledge and interest. We must continue to get in contact with these men, and know them personally as well as politically. More important, they must know us and be willing to heed what we tell them, especially when we talk to them on matters of health. Between now and the first of the year, while many of the Congressmen are at home either tending to their personal affairs or repairing their fences, we should make every effort to know them and inform them of our desires and opinions on the matter of public health and the practice of medicine. No one group of men can obtain the attention of members of Congress as well as their family physician. If you are the family physician of one of these men, get busy and have a long talk with him, to let him know the stand of the medical profession, speaking not through paid lobbists, but through the person of a tried friend, in whom he has confidence. We must assure these men that we are for all measures which tend to improve the health of the nation, both individually and collectively, but we must convince them that under our present system, we have the best health record of any place in the world and that we do not wish to jeopardize this standing. We must not be suspected of opposing changes for selfish reasons, but must have and be capable of presenting good and sufficient reasons for our opposition to proposed changes, when we are opposed.

For those either in or out of the profession who believe that there is no danger, we wish to refer them to an article in the *Chicago Tribune* on October 26, 1940 from Vichy, France, as follows "Creation of a medical order which will be the model of the organization of all professional fields under the new regime, was announced in today's official journal. The law proclaims that no one can practice medicine in France unless he has been indorsed by one of the professional Councils. It creates a superior medical council attached to the ministry of the interior, and subordinate councils in each department of the country. For one year after promulgation of the law these councils will function by government appointment, but after that it is provided that the councils will be renewed by vote in the profession. Local Councils will have the power to summon doctors, charged with failing in their duties and to pronounce penalties against them. These may be a vote of censure, public warning, suspension from practice for a year, or permanent suspension from practice." Also on page 33

of the November issue of *Medical Economics* will be found an article which suggest that the return of peace in England will find State Medicine most firmly entrenched. Read this article and pay particular attention to the last lines "Some visualize this as the stepping-stone to complete state medicine for all Britons. PERHAPS, EVEN ON THIS SIDE OF THE ATLANTIC IT IS LATER THAN WE THINK."

Of paramount interest to the medical profession of the United States, particularly that portion below the age of 35, is the effect military preparedness is to have on the medical profession. There is no doubt that many members of the medical profession will be required to furnish necessary medical care to the greatly increased armed forces of our country. Already many of the members of the Reserve have either been called to active service or told to be ready for such a call. This is as expected. However many more men will be needed for active duties with military forces and the majority of these will apparently come from the younger men in the medical profession. Accurate definite information as to the manner in which they will be procured is difficult to obtain at this time. However, it has never been necessary to conscript from the medical profession and we hope that it will not be necessary at this time. Certainly it would not be, if we were actively engaged in a war. In an attempt to furnish the medical profession with accurate information on this subject practically every medical journal has some space alloted to this subject. On Page 81 of the November issue of *Modern Medicine* is an excellent article on what those members of the medical profession, who do not join the armed forces of the country can and will be expected to do. This is a magnificent opportunity to demonstrate the efficiency and loyalty of the medical profession, not that any such demonstration should be necessary, in view of our record in the past. There is and will be work for all who remain at home and this work should be done ably and willingly. For the first time organized medicine is receiving official recognition in carrying out the plans for conscription and we should do the job right.

On Pape 38 of the *Medical Economics* for November is an article "THE DRAFT AND YOU," which is of interest to the entire medical profession and should be carefully read by the younger members. It will probably help answer some of the questions now before them and help them in arriving at a definite decision as to what their part should be in Preparedness.

These are momentous times both here and abroad. The medical profession has both a great responsibility and a great opportunity to prove to the nation that we can efficiently care for the health of the nation in peace or emergency, and that we do not need any radical changes in methods, based on those employed in a war-torn Europe, which certainly is not an ideal in any future plans for the America we love.

E. S. Hamilton, Chairman
Medical Economics Committee

Correspondence

MEDICAL PREPARDENESS AND THE A.M.A. QUESTIONNAIRE

During the past summer the American Medical Association Committee on Medical Preparedness sent out a questionnaire to every physician in the United States and the territorial possessions to get first hand information concerning the status of every physician in relation to medical preparedness as a part of the program for national defense. Each physician, regardless of age, physical condition or membership in any military, naval or public health service, was urged to return the questionnaire properly filled out, — these to be used only for the benefit of the United States Government to determine military fitness on the part of the medical profession, and to give accurate information on the availability of physicians for special types of services, including the care of civilian populations and industrial workers in the event of mobilization of our forces.

Six weeks after the questionnaires were sent out, less than one half of the total number which went to Illinois physicians (12,306 in all) were actually returned. The office of the Secretary of the Illinois State Medical Society sent a double post card to the entire membership urging that each member fill out and return the questionnaire regardless of fitness for service, and when informed that the questionnaire had not been received, additional questionnaires were sent. Approximately 75% of all cards sent to

members were returned by November 15. As the questionnaires are of importance to the government, additional appeals have been made through many sources to those who have not returned the questionnaire.

The Secretary recently asked the American Medical Association to give information as to the number of physicians who have returned the questionnaire, and, if possible, a list of those who failed to do so. Under date of November 18 we were informed that 8,187 questionnaires had been returned by Illinois physicians, or slightly more than two thirds of the number which were originally sent out. We also received a list of Illinois physicians who failed to return their questionnaire (1,800) and a supply of questionnaires to be sent to those physicians outside of Cook County. Dr. H. P. Saunders, Secretary of the Chicago Medical Society, and a member of the State Society Committee on Medical Preparedness, has a list of those physicians in Cook County who have failed to make the proper returns, and additional copies of the questionnaire will be sent to the physicians of Cook County from his office.

In checking over a few counties to get accurate information from various parts of the state, we learned that many failed to submit their returns on account of advanced age, ill health, or membership in some military, naval or public health organization. A few women physicians thought it was not necessary for them to complete and return the questionnaire.

The Secretary of the Illinois State Medical Society and Dr. H. P. Saunders, Secretary of the Chicago Medical Society will send the questionnaire and return addressed envelope to all physicians listed as not having returned the form by November 18, 1940. Illinois should lead the list by having 100% returns, to show that the physicians of this state are anxious to give the government accurate information concerning their physical condition, fitness for any type of service, and any special types of work they are trained to perform. If completely disabled, or infirm on account of age, this information should be given promptly.

One important consideration along the line of national defense, is care of the civilian population at home, and industrial workers who may be assigned to essential duties in plants receiving government contracts, work in government arsenals, ship yards, or other types of essential service.

All information received from the questionnaires will be carefully checked and transferred to punch cards where all information will be at the disposal of the government, if it is desired. We should all cooperate in making Illinois the banner state in getting complete returns as soon as possible. We are informed that in all cases where physicians fail to submit their questionnaires, such information as may be available in the American Medical Association files will be used in preparing a card for every physician, and although this will be a poor substitute for the reliable information given by the physician himself, it must be done if the information is not forthcoming in the near future.

Your committee hopes that each physician in Illinois, whether a member of the State Medical Society or not, will submit a questionnaire in the near future so that the work may be completed at the earliest possible moment.

J. S. Templeton, M. D.
H. P. Saunders, M. D.
L. E. Day, M. D.
Harold M. Camp, M. D., Chairman
Illinois State Medical Society
Committee on Medical Preparedness

Monmouth, Illinois
November 26, 1940

SOCIALIZATION MEANS THAT MEDICINE IS A BUSINESS

To the Editor:

Can the practice of medicine become a business? I have no criticism of the principles of business, but they are based upon promoting such things that will produce more business.

In the practice of medicine the basic principles are opposite to that which would be considered good business. In medicine we try to prevent people from getting sick. This would be considered poor business. To get our patients well as soon as is possible would be poor business. If medicine is Socialized there is one thing left for the doctors to do and that would be to practice medicine on business principles.

Therefore, the Socialization of medicine means that the practice of medicine is a business. For if we are assigned to a certain num-

ber of people, that must constitute the limit of our practice. I can see no other way for the doctor to make a living but to put his work on the same principles that are used by business.

It is true that this is so different from that which the American physician has used that it is even hard for him to think of treating his patient in this way. To even think of not trying to get a patient well as soon as is possible is contrary to our present system. But, as the business man says, business is business, and if we are forced to practice medicine under this plan we have no choice in the matter. The practice of medicine must become a business and the doctor a politician, so that he can have the political influence to get the best panel that his political power can secure for him.

Charles S. Skaggs, M. D.

ALCOHOL A PUBLIC HEALTH PROBLEM

New Haven, Conn.

To the Editor:

Under separate cover I am sending you a copy of the first issue of the Quarterly Journal of Studies on Alcohol. With the discontinuance of the British Journal of Inebriety this is now the only scientific periodical in the English language devoted solely to problems of alcohol.

Alcoholism, I am convinced, is a public health problem of as great importance as that of syphilis — possibly more so. It has seemed to me that a primary step toward the solution of this problem is the collection and presentation of valid information concerning alcohol and alcoholism. I hope that the Journal will serve these purposes.

Recognizing the magnitude of the problem of alcoholism, the American Association for the Advancement of Science has recently formed the Research Council on Problems of Alcohol. The Council has chosen the Journal as its official organ.

I am faced with the problem of bringing the Journal to the attention of the numerous groups which might be interested in it. If you would care to give notice of its publication, I should be grateful.

Howard W. Haggard, M.D., Editor

A recent survey indicates that at least one of sixteen Americans is hard of hearing.

THIRD ANNUAL CONGRESS ON INDUSTRIAL HEALTH

Arrangements have been completed for the third annual Congress on Industrial Health sponsored by the American Medica Association, which will be held Monday and Tuesday, Jan. 13 and 14, 1941, at the Palmer House in Chicago.

These meetings are open to all physicians and others interested in the industrial health movement. There is no registration fee.

Topics and speakers are as follows:

Opening Session, Monday, 9:45 A. M.

Report of the Council on Industrial Health.
Stanley J. Seeger, M.D., Chairman, Milwaukee.

The Physician in Industry and National Defense.
Irvin Abell, M.D., Chairman, Health and Medical Committee in the Council of National Defense, Louisville, Ky.

Current Needs in Industrial Hygiene Research.
Philip Drinker, Professor of Industrial Hygiene, Harvard University, Boston.

The Special Nature of Industrial Practice.
C. O. Sappington, M.D., Chicago.

Disability Evaluation in Silicosis.
J. L. Blaisdell, M.D., Porcupine Clinic for Silicosis Research, St. Mary's Hospital, Timmins, Ontario.

Red Lacquer Room

OPENING SESSIONS, MONDAY, 9:45 A. M.

MONDAY, 2 P. M.

HAND INJURIES

Anatomic Diagnosis of Injuries of the Hand.
James M. Winfield, M.D., Associate Professor of Surgery, Wayne University College of Medicine, Detroit.

Treatment of Superficial Hand Injuries and Burns.
Harvey S. Allen, M.D., Chicago.

Division of the Nerves and Tendons of the Hand.
Michael Mason, M.D., Chicago.

Importance of Purposeful Splinting Following Injuries of the Hand.
Henry C. Marble, M.D., Boston.

Prevention and Treatment of Hand Infections.
Summer L. Koch, M.D., Chicago.

Red Lacquer Room

MONDAY, 2:30 P. M.

AVAILABILITY OF TRAINED INDUSTRIAL HEALTH PERSONNEL

The Trained Industrial Nurse.
Ruth Houlton, R.N., Secretary, Industrial Nursing Section, National Organization for Public Health Nursing, New York.

The Industrial Hygiene Engineer.
(Speaker to be announced.)

The Safety Engineer.
W. H. Cameron, Managing Director, National Safety Council, Inc., Chicago.

The Medical Industrial Hygienist.
Paul A. Neal, M.D., Chief of the Division of Industrial Hygiene, National Institute of Health, U. S. Public Health Service, Bethesda, Md.

The Physician in Industry.
Robert T. Legge, M.D., University of California, Berkeley, Calif.

Room 8

MONDAY, 6:30 P. M.

An informal dinner and round table discussion intended primarily for state and county medical society committees on industrial health will be held. The subject matter for discussion will include problems of organization and plans for future activity.

TUESDAY, 9:30 A. M.

Employment of the Physically Handicapped.
D. L. Lynch, M.D., President, American Association of Industrial Physicians and Surgeons, Boston.

Aging as a Problem of Industrial Health.
Edward J. Stieglitz, M.D., Research Associate in Gerontology, National Institute of Health, U. S. Public Health Service, Bethesda, Md.

ACUTE RESPIRATORY DISEASE IN INDUSTRY

Incidence and Costs of Acute Respiratory Disease in Industry.
Anthony J. Lanza, M.D., Assistant Medical Director, Metropolitan Life Insurance Company, New York.

Respiratory Disease and Air Conditioning.
Carey P. McCord, M.D., Chairman, Committee on Air Conditioning of the American Medical Association, Detroit.

The Role of the Physician in Industry in the Control of Acute Respiratory Disease.
George M. Piersol, M.D., Philadelphia.

Red Lacquer Room

TUESDAY, 2 P. M.
INDUSTRIAL OPHTHALMOLOGY

Economic Importance of Visual Disability in Industry.
Leonard Greenburg, M.D., Chairman, Industrial Advisory Committee of the National Society for the Prevention of Blindness, New York.

Essentials of First Aid and Later Management of Industrial Eye Injuries.
Sidney Walker Jr., M.D., Chicago.

Detection and Control of Defective Vision in Industry.
Arthur M. Culler, M.D., Dayton, Ohio.

Protective Equipment for Eyes in Industry.
Thomas D. Allen, M.D., Associate Clinical Professor of Ophthalmology at Rush Medical College, Chicago.
Henry F. Carman, M.D., San Francisco.

Red Lacquer Room

WEDNESDAY, JANUARY 15

On the day following the congress, the Chicago Medical Society will conduct clinics illustrating practical problems in industrial medicine, industrial hygiene and traumatic surgery.

On the same day the Chicago Medical Society will hold a dinner and evening meeting on the relationship of the private practitioner to the industrial health movement. The program will be:

Industrial Health—A Medical Opportunity.
Stanley J. Seeger, M.D., Chairman, Council on Industrial Health, American Medical Association, Milwaukee.

Medical Service for the Small Plant.
Anthony J. Lanza, M.D., New York.

The Control of Syphilis in Industry.
Harold A. Vonachen, M.D., Peoria, Ill.

Further details regarding clinics and other demonstrations will be provided registrants at the congress, all of whom are invited to participate.

WOMAN'S AUXILIARY TO THE ILLINOIS STATE MEDICAL SOCIETY.

The first regular Board Meeting of the year was held at the Palmer House in Chicago on Saturday, Nov. 9th. The President, Mrs. Harry Dooley called the meeting to order at ten A.M. Thirty members responded to roll call and Mrs. V. E. Holcombe, National President, was our Honored Guest.

The President told of her visits to the various County Auxiliaries and reported on their activities. In speaking of her desire to carry out the National Program for the year she stressed, in addition to "Hygeia," the campaign for the National Publication, the "Bulletin," the importance of the Membership Drive, and the value of the Benevolence Fund.

Mrs. Holcombe, in her After-luncheon Address, told of her experiences during her official travels to nineteen states. She stressed the importance of carrying out the objectives for the year and stated she was very gratified in the enthusiasm and the interest displayed in our state.

The President-Elect, Mrs. Harry Otten, who is also Organization Chairman described some of the problems encountered in the forming of new County Auxiliaries.

Mrs. H. B. Henkel, chairman of the committee on the Benevolence Fund explained the objectives of the fund, in detail, for the benefit of the new members of the Board.

Mrs. E. M. Egan, chairman of the committee for "Hygeia" told of the drive for subscriptions and sighted the fact that a number of Counties have designated the month of December for "Hygeia." She called attention to the special price offered the doctors and their wifes during this month.

(The State Committee on Press and Publicity earnestly requests that all information be sent to this Chairman at an early date. This may be done by the local publicity worker or a designated member. Everyone is interested in learning the activities of others, but it is not possible unless your reports are sent to the proper source.)

Mrs. C. W. Stuart
Chairman, Press and Publicity.
330 N. Austin Blvd.,
Oak Park, Illinois.

MEDICAL TECHNICIANS SOUGHT FOR WAR DEPARTMENT

Medical technicians experienced in surgical and X-ray work are needed by the War Department. The United States Civil Service Commission has announced an examination to fill these positions in the following grades and optional subjects: Senior medical technician (roentgenology), $2,000 a year; medical technician (roentgenology, and surgical), $1,800 a year; assistant medical technician (roentgenology, and surgical), $1,620 a year. The salaries are subject to a retirement deduction of 3½ percent.

Applications must be on file with the Commission's Washington office not later than November 28, if received from States east of Colorado and not later than December 1, 1940, if received from Colorado and States westward.

Applicants must have completed a 4-year high-school course, unless they pass a written general test, and in addition, they must have had responsible experience in surgical duties in an operating room or clinic, or in X-ray work including X-ray photography and posturing, and in the installation and maintenance of X-ray apparatus. Appropriate college study may be substituted for part of the required experience. With the exception of those who have not completed the high-school course, applicants will not be given a written test. All competitors will be rated on their qualifications as shown in their applications and on corroborative evidence.

Detailed information regarding the examinations and the proper application forms may be obtained from the Secretary of the U. S. Civil Service Examiners at any first- or second-class post office or from the United States Civil Service Commission, Washington, D. C.

CIVIL SERVICE COMMISSION CITY OF EVANSTON OPEN COMPETITIVE EXAMINATION *LABORATORY TECHNICIAN*

The Civil Service Commission of the City of Evanston, Illinois announces an examination for Laboratory Technician for the Evanston Health Department.

DUTIES AND RESPONSIBILITIES: Under general supervision to do routine work of a technical nature in the Public Health Laboratory of the Evanston Health Department; to make routine examinations and analyses; and to do other work as required.

SALARY AND OPPORTUNITY: One appointment will be made immediately at $125.00 per month. The list will be in effect for at least two years. Promotions in the City service are made as far as practicable from among City employees.

THE EXAMINATION: The examination will consist of three parts, weighted as follows; a written test, weight 40%; an evaluation of experience and education, weight 30%; and an oral interview, weight 30%. A passing grade of 70% is required on each part of the examination. Candidates who pass the examination will be given a medical examination before being certified for appointment. Dates of the tests will be announced later. All successful candidates will be fingerprinted.

APPLICATION PROCEDURE: Applications and additional copies of this announcement are available at the office of the Secretary and Chief Examiner of the Evanston Civil Service Commission, 2nd Floor, City Hall, Evanston, Illinois. *Applications must be filed before 12:00 Noon, November 23, 1940.*

PUBLIC HEALTH NURSE

The Civil Service Commission of the City of Evanston, Illinois announces an examination for Public Health Nurse for the Evanston Department of Health.

SALARY AND OPPORTUNITY: Four appointments are to be made immediately at $150.00 per month. The list will be in effect for at least two years. Promotions in the city service are made as far as practicable from among city employees.

MINIMUM QUALIFICATION REQUIREMENTS:

Age: Not less than 25 nor more than 55 at the time of application.

Residence and Sex: This examination is open to all female citizens of the United States *resident in the State of Illinois* for one year prior to the date of application.

THE EXAMINATION: The examination will consist of three parts, weighted as follows: a written test, weight 35%; an evaluation of education and experience, weight 35%; and an oral interview, weight 30%. A passing grade of 70% is required on each part of the examination. Candidates who pass the examination will be given a medical examination before being certified for appointment. Dates of the test will be announced at a later date. All Successful candidates will be fingerprinted. Driving tests may be given.

APPLICATION PROCEDURE: Applications and additional copies of this announcement are available at the office of the Secretary and Chief Examiner of the Evanston Civil Service Commission, 2nd floor, City Hall, Evanston, Illinois. APPLICATIONS MUST BE FILED BEFORE 12:00 NOON, SATURDAY, NOVEMBER 23, 1940.

TWO ENDS

"The Lord gave us two ends,
One to sit on and the other to think with.
A man's success depends upon which end he uses most.
It is a case of heads you win, or tails you lose.
Take your choice."

"By the way," said a lawyer in drawing up a will, "I notice you have mentioned six bankers as pall bearers. Wouldn't you rather choose some friends with whom you are on better terms?"

"No, that's all right," was the quick reply, "Those fellows have carried me so long they might as well finish the job."

Original Articles

A NEW ARTIFICIAL LARNYX WITH A HISTORICAL REVIEW

Historical Review

W. L. HANSON, M. D.
EAST ST. LOUIS

A careful study of this subject reveals several matters which are related to it and which are very important.

In considering the artificial larynx, one automatically is handling the problem of rehabilitation of the patient with a laryngectomy. One has only to be in contact with a number of these patients to realize their great handicap, and their difficulty in maintaining their economic and social status.

Nearly all are active and worthwhile citizens. Most of them are of the salesman or executive type, and all of them have been fond of talking and have been active conversationalists. One might think that since the disease is usually thought to occur later on in life, that this economic phase would not enter into the picture, but one patient we have seen, had a laryngectomy at the age of 27, five or six in their 30's, and nearly all the rest before the age of 50. Three of this group are women, one of whom was a secretary and one an opera singer. The moroseness and the degree of melancholia in nearly all of these patients, who are not properly fitted with an artificial larynx, is hard to over-emphasize.

Another phase of the aphonic state of the laryngectomized patient is the frequent decision on the part of the patient not to submit to the operation of largngectomy because of the inevitable state of speechlessness that follows.

The fact that these patients are so desirous of regaining their speech, is probably responsible for the great amount of effort on their part, and that of their physician to give them a new voice.

The first inventor of an artificial larynx that I find in the literature, was Czermak, who made one in 1859, and was followed by Bruecke somewhat later. Czermak's patient was rendered voiceless by a complete chronic stenosis of the larynx.

In 1861, Bruns improved the instrument by using flexible tubing and rubber for the vibrating band.

Bilroth, who is credited with the first total extirpation of the larynx in 1873, with Gussenbauer, created an artificial larynx.

Braun, at about this time, utilized a hypopharyngeal fistula.

D. Foulis, 1877, described in the *British Medical Journal,* a vulcanite laryngeal tube which contained a vibrating reed which took the place of the vocal cord. I assume in reading the abstract, that is was inserted into the tracheal opening.

In 1883, C. Labus, a Frenchman, described a new largyngeal fantome. There were three French modifications in the next few years.

In 1887, Stoerk perfected a whistle which was attached to the trachea on one end and into the mouth with the other. It was not very satisfactory so he used a bellows instead of the lungs and did better.

In 1892 a German, A. Hochenegg, made a new apparatus and used the Czermak-Stoerk apparatus with a bellows and a nasal tube.

There were several instruments before 1900, described by Italian and Spanish surgeons.

There were about ten modifications between 1900 and 1909 when Professor Gluck of Berlin, presented a patient aged 42, with a laryngectomy and an instrument, which, held in front of the patient's mouth made vowel sounds audible. At the same time, R. H. Woods in the *British Medical Journal,* told how he took this tube, put a reed into the distal end, and in this way the patient, by blowing through the tube intoned in a monotone. Gluck and Sorenson devised a variety of artificial larynges utilizing decorative cabinets, arm and electric bellows and a phonographic record for tone production — the tone being led into the nasopharynx.

Several other modifications came into the field until A. G. Tapia described his new apparatus in Spain, 1914. His instrument is still the choice of Spain and the Spanish-speaking countries of South America. I am informed by Professor Alfredo Alcaino of Santiago, Chile, that this is also the choice of Central America. He states Dr. Tapia has done 1,000 laryngectomies. The instrument is similar to the one I have shown, in slides with the rubber band transverse, only he used an extremely thin band of rubber.

The first notable improvement in this country was by J. A. McKenty of New York, in 1920.

Read before Section on Eye, Ear, Nose & Throat, Illinois State Medical Society, May 22, 1940, Peoria.

He used the rubber band as a reed transversely, but discovered that a soft rubber mouth piece was a great aid in improving the quality of the voice. The case of his instrument was hard rubber.

In 1931, Dr. McKenty stated that: "It was the increasing number of laryngectomized patients under his care which resulted in his endeavor to produce a workable artificial larynx. The first attempts were to increase the whispering voice which all of these patients acquire to a greater or lesser degree. A rubber tube from the tracheal opening to the voice box and one from it to the back of the tongue accomplished a slight improvement in the whisper. Dr. McKenty stated that Dr. Tapia's larynx produced a high-pitched, squeaky, unpleasant, unnatural voice.

In 1924, Dr. McKenty enlisted the cooperation of the Western Electric Company in the development of a larynx which overcame to a considerable extent the defects of the others in that it delivered a low-pitched, somewhat gutteral but strikingly human voice. His ideas on the best way to accomplish this, namely by a transverse rubber band were not at first accepted as the Western Electric Company felt a better voice could be developed with reeds — despite the fact that he told them that he had tried reeds and failed. He said the reed requires too strong a current of air to vibrate it, thus tiring the patient, and the voice it produces is a musical and singing tone, very disagreeable to the ear. His plan was adopted and partially worked out. The result was a very useful instrument, not ' "embarrassing, burdensome, impractical, delicate and difficult to repair." ' In the hands of any one of ordinary mechanical ability it worked perfectly.

H. L. Pollock and F. L. Lederer described an artificial larynx in the Transactions of American Ophthl., in 1922.

"An artificial larynx was presented, which consisted in the main of a trachea canula and a pharyngeal canula, the latter being made of flexible ruber in order to prevent irritation of the epiglottis that results when a metallic tube, which does not give, is used. A diaphragm arrangement between the two allows for phonation. The instrument thus far is still in its experimental stage, but even so far as it has gone, it permits a laryngectomized patient's voice to carry 10 to 12 feet."

In 1927, E. I. McKesson described a new mechanical larynx in the *Journal of the A.M.A.* This artificial larynx, which was shown in the lantern slides, is rather popular today and the reed element is a thin rubber band inserted transversely in the container.

In April, 1931, Charles Sheard and Adrian Porter of the Mayo Clinic, presented a new simple artificial larynx. It is one of the most widely used instruments at the present time and it was claimed that it would operate at all times and under all circumstances, such as that of freezing weather, and would permit of ordinary or loud speaking, would possess a given note which could be made as high or as low as desired and which could be reproduced by replacement of the reed in case the reed was broken or damaged in cleaning. The case is of metal and the vibrating reed is made of thin hard rubber.

In 1932, M. A. Goldstein described the modification of an artificial larynx, before the American Laryngological Association. He also presented metal discs for the permanent recording and reproduction of speech.

He presented a new terminal on the rubber connecting tube to be applied to the larynx after the tracheal canula has been removed, and it consisted of a half of a rubber sponge ball, with a center punched out, and adapted to a tracheal fistula.

He removed the rubber flange from underneath the metallic reed, and substituted a small fiberoid flange with small holes in it in order to avoid having the reed adhere to the base by moisture. He also stated that this modified the pitch at least three or four intervals.

In 1936, Iglauer presented a new artificial larynx with a patient demonstrating its use. It is much the same as that made by the Bell Telephone Company except that a thumb screw regulates the movements of the reed. Dr. Iglaur remarks that this patient perfects a new instrument about every six months.

The instrument probably in greatest use is that made in the Bell Telephone Laboratories. The first instrument was made by George W. Burchett of Peakskill, New York, and patented in December, 1931. The second instrument was invented by Robert R. Riesz of New York in December 1931. It is the instrument shown in

the lantern slides and used now. In 1932 and 1933 they modified the instrument with reed adjusting devices.

In December, 1934, George Burchett, again made very slight changes in the artificial larynx but presented a bellows which was shown in the lantern slides, with which a patient can operate an artificial larynx.

Mention should be made here of a patient of Dr. J. C. Beck, 1927, who produced a fistula tract from his larynx to his trachea by means of a heated ice pick, which was followed by a good speech.

In September, 1938, my patient Mr. Ottie Roberts had a laryngectomy done by Dr. New in the Mayo Clinic. He could not obtain a satisfactory voice through the buccal-pharyngeal or the esophageal voice. To my surprise, he returned in several days with a number of definite ideas and in several months the present instrument was in operation. The general principle is the same as the other instruments on the market, in so far as the air passes through the tracheal orifice, causes the reed to vibrate and this column of air passes to the mouth where it is modulated into words.

Claims Made for the Instrument: The following is a list of the new improvements over any other artificial larynx, to the best of our knowledge.

A. Made of 98% Hard Rubber which eliminates any and all metallic sounds and produces a sound closer to the natural human voice.

B. Takes Less Air Pressure and therefore less exertion on the part of the lungs of the user. The reason for this is the construction of the lay and the air passage under the reed. The lay is tapered to a hair line edge. This edge as can be seen becomes sharper as it nears the base of the lay. This prevents saliva from holding the reed by capillary attraction thus alowing free sound producing vibration of the reed. All other sound devices have a wide flat lay and because of this must be dried every few minutes of talking.

The millimeters pressure for the operation of this voice box were used in the construction of the accompanying graph and were obtained by the use of a Sphygmomanometer.

In my opinion the evenness of Mr. Roberts' Graph indicates that less and more uniform pressures are required to operate his speaking tube. We were not equipped to measure the intensity of the sound emited in each test, however we tried to keep the sounds as uniform as our hearing power would permit.

The graphs indicate the trend, i. e. Ours requires 12-13 MM Nerc pressure and others 25-29 MM Nerc pressure.

The method of obtaining the graphical chart was by the user inhaling the maximum amount of air into the lungs and then exhaling the maximum amount of air through the voice box and registering the amount of sound by the use of a stop watch. The chart readily shows the difference between the amount of time the sound lasted on each particular sound box, for the maximum amount of air exhaled through same.

C. Total weight of the voice box is one and one-sixteenth of an ounce, which is lighter *(Approximately One-Half the Weight)* than other artificial voice boxes making it less tiresome for the user to hold up to his mouth.

WEIGHT OF ARTIFICIAL LARYNGES

H-Roberts Voice Box.	31.63 grams.
Voice Box A.	63.84 grams.
Voice Box B.	64.43 grams.

D. The hard rubber voice box is *More Resistant To Moisture* condensation on the interior in cool weather. This is a very important factor as moisture collects quicker in all mechanical voice boxes having a metal case; thus making it possible to talk much longer without drying the voice box.

E. The *Only Movable Part* on this artificial larynx is the vibrating reed.

F. The lay or reed base is one complete and separate unit from the sound box or chamber and may be removed from the sound box or chamber for cleaning by simply lifting it out in the same manner as one would pull a cork out of a bottle.

G. The *New Reed Holder* consists of a cork wedge which makes a cushion and holds the reed firmly in its place. By loosening the cork wedge with the thumb and forefinger the operator may slide the reed upward or downward on the lay which in turn changes the voice from a lower to a higher pitch.

H. A. *Soft Rubber Valve and Hard Rubber Valve Seat* for inhaling the air into the lungs. This valve is not needed but is optional.

The new improved *Breather Valve,* which fits in the bottom of the sound box and *Is Completely Hidden From View. This Valve greatly Re-*

leives Manual Operation of the Thumb over the breather hole.

The Breather Valve Made of all Rubber which is all Moisture Resisting. This valve is *Free From Any Metal Springs* and is very *Compact and Fool-Proof.*

I. *Simplicity of Design* and construction *Eliminating Use of Tools.*

J. *Ease of Cleaning.*

K. Reed lay which *Prevents Sticking of the Reed* by capillary attraction.

L. The swivel top can be turned in a radius of 180 degrees when inserted in sound box. This makes it possible to lay complete assembly on any smooth surface without permitting the mouth piece to come in contact with same by simply turning the lay and base of reed a few degrees. This makes for *More Sanitary Conditions Because the Mouthpiece Does Not Touch Any Surface.*

M. *This Voice Box Will Not Bend or Break if Dropped* which makes it superior to metal. Should a metal box be dropped it will bend or be dented to such an extent that the box will not operate efficiently.

The instrument was demonstrated by Mr. Roberts.

DISCUSSION

Dr. Francis L. Lederer, Chicago: In my earliest experience in the specialty and association with the recognized and proved solution to the cure of malignant diseases of the larynx, viz., laryngectomy, I have been impressed with the necessity for rehabilitation of the patient deprived of a voice. As early as 1922, Drs. Joseph Beck, Harry L. Pollock and myself became vitally interested in the problem and presented an experimental apparatus before the American Academy of Ophthalmology and Otolaryngology. The proposed artificial larynx consisted of a tracheal cannula and a pharyngeal cannula, the latter being made of flexible rubber in order to prevent irritation of the tongue. We had a diaphragm arrangement between the two systems which permitted sound to be made audible at a distance of 10 to 12 feet. Even in its experimental form, the resultant sound was better than that experienced with the von Bruns, V. Mikulicz or v. Bergmann types of larynges. The cost of experimental construction seemed so prohibitive that we discontinued our mechanical efforts, especially when we learned that the Bell Telephone Company became interested in such a device.

Interest in rehabilitation of the voice of the laryngectomized patient is of tremendous sociologic, psychologic and economic importance. These patients have often remarked that in the majority of instances the laryngologist fails to sympathetically evaluate the plight of one faced with the problem of losing a larynx or after he or she has suffered voice deprivation. I have on occasion presented a few laryngectomized patients who, after some guidance and through their own dogged perseverance, have developed audible speech.* The development of a pseudovoice adds new functions to a group of organs which are adaptable because they may be used to retain and forcibly expel quantities of air, viz., the esophagus and stomach. These then supply a new air chamber situated somewhere in the hypopharynx. The patient still requires the bellows action of his lungs, the articulatory forces of his buccal musculature, and adds the smooth working eructations of a combination of an air-filled stomach, a dilated esophagus and a cricopharyngeus muscle which acts as a pseudo-glottis, stretched and narrowed at will and impinged upon by swallowed and/or inspired air. The education of this new mechanism is not readily achieved by all patients and to others has reacted unfavorably in that they experience a revolting influence of a voice that amounts to a glamorous eructation. Dr. Beck, a pioneer in the field of laryngology, has been kind enough to come here today and will demonstrate by means of a recording one of my pseudo-voice patients, as well as a film and recording of one of my patients who employs the Roberts-Hanson artificial larynx. I would remind you that some years ago that one of my patients with such a voice was exhibited as a "Believe It or Not" phenomenon.

The contribution of the Hanson-Roberts apparatus to this field is most commendable. The design and mechanics of the device have been ably described. What can be more satisfactory than to have a person who must live under this handicap help to perfect such a larynx? I can only judge from what patients report, viz., the lack of effort in the use of this apparatus and the ease of acquiring a knowledge of its use, to say nothing of the non-metallic sound which may be produced.

*Arch. Otolaryng. 15: 947 (June) 1932.

ENDOCRINE STUDIES OF PATIENTS AFTER SUBTOTAL HYPOPHYSECTOMY

PAUL STARR, M.D. AND LOYAL DAVIS, M.D.

CHICAGO

A systematic study of endocrine function in patients who have had subtotal hypophysectomies has been made with the intention of directing substitution therapy in the larger group of patients who have had non-functioning tumors of the hypophysis, and of determining the neces-

From the Departments of Medicine and Surgery, Northwestern University Medical School.

Read before Section on Medicine, Illinois State Medical Society, May 21, 1940—Peoria.

sity for further depressant therapy in those having hyperfunctioning pituitary adenomata. This was suggested by experience with patients after subtotal thyroidectomy, in whom a state of hypothyroidism or hypoparathyroidism, or rarely, persistent hyperthyroidism required continued supervision and treatment. Disability in patients with pituitary disease is due to failing vision, the usual indication for operation, or to cerebral damage in important neighboring hypothalamic areas, or to endocrine deficiency or excess. Any or all of these, present before operation, may continue postoperatively. The endocrine factors should be susceptible of correction.

Plan of Endocrine Study: After the usual complete clinical examination the following plan of study was carried out: The basal metabolic rate was determined. It has been found in animals that total hypophysectomy of the normal animal leads to a metabolic rate 25 per cent less than average normal. In addition, if thyroid atrophy occurs, the metabolic level will fall to that of athyreosis. The blood cholesterol was also determined. Hypopituitarism is characterized by normal or subnormal levels, but if hypothyroidism is superimposed the blood cholesterol will rise.

The adrenal cortex is maintained by the tropic action of a pituitary factor. The condition of the adrenal cortical function in our patients was determined by the Wilder test[1]. This consists of two days and four hours during which the ingestion of sodium is reduced in the diet to a known low level and the potassium is raised by foods selected and the addition of potassium citrate; the water intake is prescribed according to the patient's weight. Under these conditions the normal adrenal cortical function will restrict the loss of sodium and chloride in the urine, while in adrenal deficiency the sodium and chloride concentration of the urine in the last period of the test becomes elevated. Comparison of many other substances in the blood and urine indicates that among all these the concentration of chloride in the urine in the four hours after the two days dietary preparation is the most significant for the establishment of adrenal cortical function. This test, of course, demonstrates only the electrolytic controlling function of the adrenal and does not determine directly the carbohydrate controlling function. The normal values found for the chloride concentration of the urine in the terminal four hour sample fall below 125 milligrams per 100 c.c. of urine; values between 125 and 225 milligrams may occur in normal persons or in those having adrenal insufficiency; values above 225 of chloride ion in milligrams per cent occur only in patients with adrenal cortical insufficiency. The sodium loss is adequately represented by the chloride determination. This test, then, is an extremely simple and valuable one, which requires only dietary control for 52 hours and a chloride titration in the urine. Except for the time involved it is the easiest of all the endocrine function tests. Its introduction now allows us to determine the condition of one of the major glands that has hitherto been neglected in much endocrine analysis.

Carbohydrate balance involving, as it does, the diabetogenic function of the pituitary, the responsiveness of the adrenal cortex to that gland, the state of the liver as influenced by the thyroid, and the activity of the insulin-producing organ, was studied as usual by the glucose tolerance and insulin tolerance tests. One hundred grams of glucose was the test dose in the former, with capillary blood sugar determinations made before and one-half, one, two and three hours after ingestion of the sugar. Ten units of plain insulin were given in the latter, with similarly distributed blood sugar determinations.

The gonadotropic function of the pituitary was estimated by the history of amenorrhea and loss of sexual activity, combined with the physical examination of the sexual organs to determine the degree of atrophy. In some cases the vaginal epithelium was studied for evidence of estrogenic activity according to the morphology of the cells and their staining characteristics, after the method of Papanicalao. Parathyroid function was observed by determination of the blood calcium and phosphate and a study of bone x-rays. In one case hyperparathyroidism was discovered and titration of urinary calcium was carried out.

As is usual in such series, the number of patients with hypopituitarism was three-fourths of the whole number, in this case 18 of 25. In all instances these patients had hypopituitarism before operation, occasionally with cerebral damage accompanying the visual disturbance. The

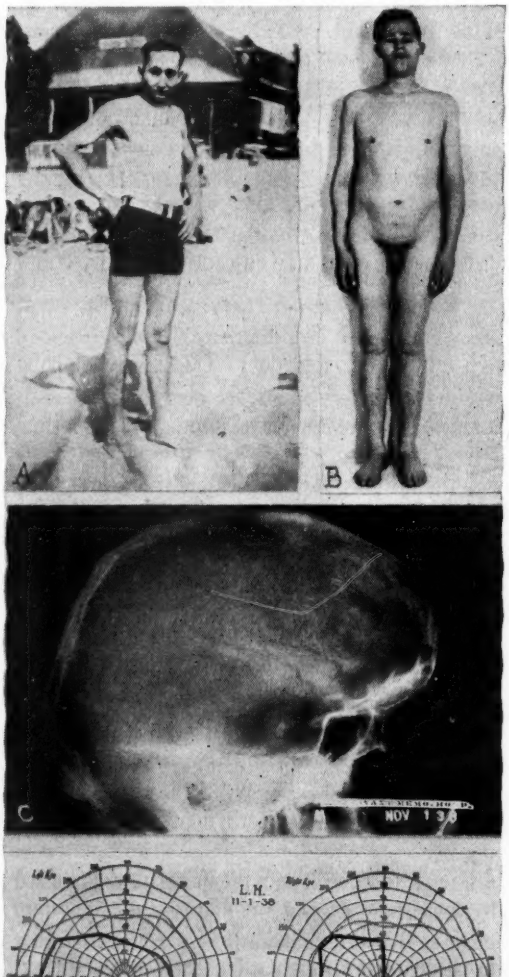
hypopituitarism continued after operation; the nervous disorder was in some instances improved but in other cases increased; the visual loss was usually arrested or relieved. Several cases developed blindness some years after operation. These 18 patients may be divided into three groups: first, those with severe hypopituitarism, with resultant total disability, with more or less cerebral damage, and more or less blindness; second, those with endocrine deficiency and moderate disability; and third, a group with slight endocrine deficiency and relatively little incapacity. There are 7 patients in the first group, 5 in the second, and 6 in the third.

ILLUSTRATED CASES

The case history of a patient illustrating the first group is as follows: Mr. L. H.: Until 27 years of age this patient was an active, alert clerk in a hardware store. He was married and had two children. In the summer of 1930 a box of hardware fell on his head as he was pulling another box out from under it. The blow dazed him momentarily but did not knock him down or cause any laceration. After this incident he began to feel weak and to have difficulty in remembering the whereabouts of articles in the store. Loss of libido and impotence were noted during the next year. Two years later, that is, at 30 years of age, he was under treatment by a reputable physician for six months because of weakness; colonic irrigations and iron and arsenic were given without benefit. At 31 years of age he was a patient at an excellent hospital where treatment for anemia was given. While in the hospital he began to suffer from headaches which have continued to the present time; they are frontal and diffuse, accentuated by severe spasms of pain lasting a few seconds. At 31 years of age loss of beard growth, and loss of hair on the chest and arms began; at present he has no hair on these areas whereas at one time he had a thick growth. At this same age failing vision occurred and finally the true nature of his difficulty was recognized. X-ray treatments were given over a two year period with only temporary relief. At the age of 35, eight years after the first evidence of pituitary disease, he entered the hospital on Doctor Davis' Service with the following complaints: weakness, fatigue, lethargy; loss of sexual urge and potency; loss of facial and body hair; unexplained obesity; variable headaches; loss of vision; polyuria and polydypsia. (Preoperative and postoperative photographs; sella x-ray; visual fields). (Fig. 1.)

X-ray showed a large, distorted sella with a shadow of suprasellar calcification. A cystic craniopharyngioma was found at operation; this was evacuated. Postoperative recovery was good; vision was retained and the headaches relieved. Very rare sexual activity occurred after an absence of eight years, but somnolence and marked weakness continued. Approximately a year after operation cerebral pathology became manifest; convulsions and hemiparesis have occurred and the patient is completely disabled.

Endocrine study showed extreme glandular deficiency; the basal metabolic rate was -40 per cent, the blood cholesterol 392 milligrams per cent, the Wilder test 380 milligrams per 100 c.c. of urine; the sugar tolerance test flat; insulin



Cystic Craniopharyngioma and Hypopituitarism.

Fig. 1. Mr. L. H. A) Before onset; note absence of obesity, normal hirsutism; B) Preoperative; note obesity, loss of hirsutism, female pubic hair; C) Skull x-ray; note enlargement and erosion of sella; D) Visual fields — preoperative.

sensitivity marked; libido was very slight; the testicles and prostate were atrophic. Hence, deficiency of thyrotropic, adrenotropic and gonadotropic hormones was indicated. In this patient the large cystic craniopharyngioma had evidently damaged the adjacent brain structures irreparably and destroyed the pituitary by pressure.

The remaining patients in this and succeeding groups are much less discouraging because injury to the brain is less severe and endocrine deficiency less extreme. There is, however, a group of patients partially disabled. This type may be illustrated by the case of Miss M. H.

This patient entered the hospital at 53 years of age. She had a premature spontaneous menopause at 28 years of age. At 43 years a period of headaches and pain in the right eye had occurred. A diagnosis of hypothyroidism was made although doubtless pituitary disease could have been diagnosticated at that time. These symptoms subsided. On admission to the hospital two years later she complained of failing vision for two months, somnolence, unsteady gait and uncinate fits. Left homonymous hemianopsia was present.

X-ray showed an enormous sella. At operation by Doctor Davis the brain was normal; the right optic nerve was tightly stretched over a purple tumor mass that lay between the two nerves and beneath the chiasma. The capsule was opened and adenomatous tissue removed by curet until the tumor collapsed. Recovery was uneventful with enlargement of the visual fields. The patient did not return to her former occupation because she did not feel strong enough. Her vision has improved greatly. She had been very much inclined to forget things and had been unable to recall events that happened, prior to operation.

At the time of our endocrine study five years post-operative she presents the picture of moderate obesity in a pleasant, cooperative woman of 53 years. She carries on normal but limited home life. The blood pressure is 148-78, pulse 68, temperature normal. The hair is normal, the skin smooth. The eyes react to light and accommodation. The tongue is normal. The thyroid is palpable but not nodular. Pelvic examination finds slight atrophy of the vaginal epithelium and a small uterus.

Endocrine studies indicate hypometabolism with a basal metabolic rate of -18 per cent; blood cholesterol of 324 milligrams per cent demonstrates hypothyroidism. The Wilder test is normal (70 mgms. per cent.); the sugar tolerance test is low; there is marked sensitivity to insulin; the blood sugar dropped from 78 to 43 in one hour and signs of hypoglycemic shock occurred. Gonadotropic function was absent. She has been benefited by small doses of thyroid.

As an example of a still more favorable course the case of Mr. H. E. may be presented. He is now 52 years of age; he is a salesman in a department store, actively at work. He is married and has two children; the younger was born when he was 34 years of age. The following year while playing tennis he suddenly discovered that his left eye was totally blind; this persisted for two or three days, after which the blindness was confined to the temporal field of the left eye; the condition remained without notable change until he was 38. Sexual impotency began approximately at the same time as the amblyopia. At 38 years he experienced severe, constant headache for a period of about ten days; he then noticed that he was unable to see traffic lights or to read any part of a newspaper other than the headlines. He consulted an "eye doctor" who prescribed rest for the eyes for a few days. From then until 45 years of age he read only with the help of a magnifying glass. Late in his 44th year he consulted a doctor in Chicago about his eyes, was told he had syphilis, and was given a course of neoarsphenamine. After some treatment he had arsenical poisoning; his hair fell out, he had a high fever, and his skin desquamated. Meanwhile the sight in both eyes became steadily worse. Finally he had a series of severe headaches which continued for two weeks until one morning he woke up completely blind.

X-ray showed marked distension of the sella with erosion of the posterior clinoid processes and floor. Visual fields showed blindness of the left eye and a small nasal field of the right eye.

Doctor Davis' description of the operative findings is as follows: "We visualized the right optic nerve tightly stretched and thinned out over the surface of a large purple dome-shaped tumor mass that was all in front of the chiasm. The capsule was opened. The contents of the tumor were dark chocolate-brown fluid and a small amount of soft, degenerated adenomatous tissue. This was removed completely so that the chiasm and nerves hung loosely in the field. The entire top of the capsule was removed. This was undoubtedly a chromophobe adenoma which had had a hemorrhage into it or had undergone degeneration." The patient made a good post-operative recovery and has been working ever since — a period of seven years. Vision has not returned to the left eye but the nasal field of the right eye is maintained.

Endocrine study six years after operation gives the following results: Basal metabolism is within normal range (-14 per cent). There is evidence of slight hypothyroidism, that is, the blood cholesterol is 282 (normal upper limit 240 mgms. per cent). An interesting finding on a single determination is a very high Wilder test — 568 mgms. per 100 c.c. urine; this does not fit with his clinical condition, although his blood presure is low normal (108-78). Sugar tolerance is normal and insulin sensitivity is absent. Gonad atrophy and absence of activity indicate lack of gonadotropic function.

This man was extremely fortunate that the long neglect and incorrect diagnosis of his condition was associated with a tumor that did not destroy all pituitary function and did not injure the brain although three-fourths of the visual field has been lost.

The least damaged patient in this series is Mr. A. L. He is an active business executive who at 46 years of age experienced loss of libido. During the following year he noted fatigue and finally, six months before operation, diminution of visual fields. The correct diagnosis was made at this time. Nine x-ray treatments were given soon after the visual loss was discovered. There was temporary improvement but two months later sudden, marked limitation of vision occurred and he immediately presented himself for operation. The x-ray showed an enlarged sella with eroded floor. Visual fields displayed bitemporal hemianopsia.

At operation curettage of a large hemorrhagic and partly degenerated tumor relieved the pressure on the optic nerve. He has since returned to work and has recovered vision and sexual activity. It is now three years since operation.

Endocrine studies made last year found slight hypometabolism with normal thyroid function as indicated by a blood cholesterol level of 234 mgms. per cent: normal adrenal cortical activity; Wilder test 70 mgms. per cent; normal sugar tolerance; absence of insulin sensitivity; and normal condition of genitalia and sex activity.

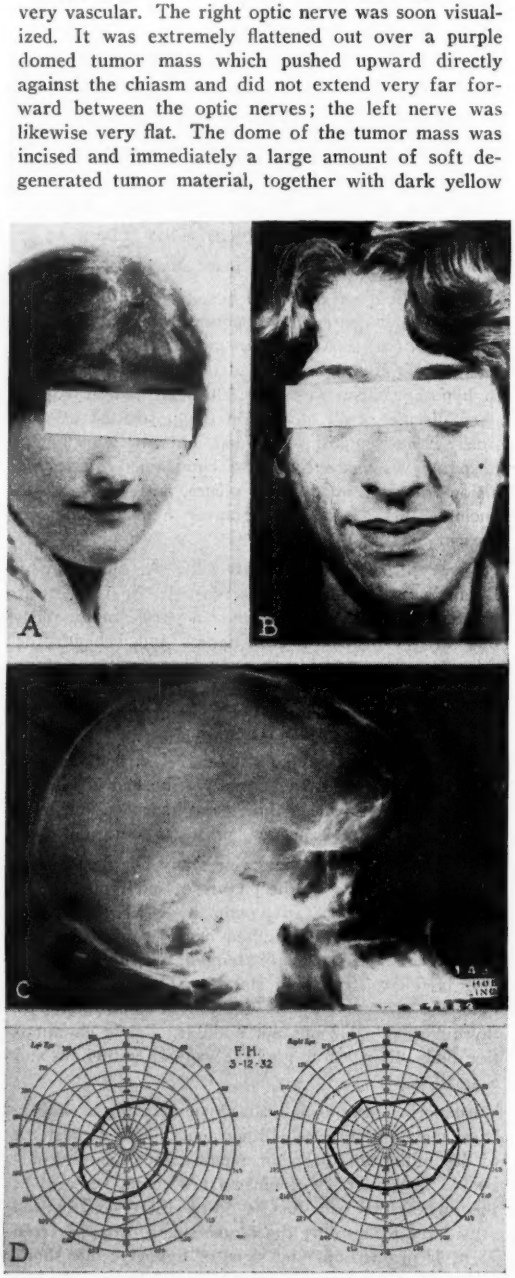
Of the seven patients with hyperpituitarism none has developed hypopituitarism postoperatively; three have persistent hyperpituitarism, two of these with manifest hyperthyroidism, diabetes and hypertension. All of this group clinically had acromegaly. In the three disabled patients acromegaly was severe before operation; in the four well adjusted patients the development of acromegaly was slight.

Mrs. F. H. illustrates the persistent form of hyperpituitarism. She entered the hospital when 35 years of age, complaining of failing eyesight for two years, acromegalic changes in face, hands and feet for six years, premature menopause and increased weight. A normal pregnancy had occurred five years previously. She had had severe headaches which stopped following x-ray treatment of the pituitary.

Examination revealed a typical acromegalic woman of 35 years; she was intelligent, rational, cooperative, oriented and had a good memory for past and present events. The visual fields showed a bitemporal hemianopsia with contracted binasal fields. The head was long with a prominent occiput; the skin of the face was rough, dry and covered with blotchy markings. Nose very large; lower jaw protruding and greatly enlarged. Tongue large, filling the mouth more than in the average individual. Neck full but symmetrical; thyroid palpably enlarged and firm. Breasts very large and pendulous. Lungs and heart normal. Blood pressure 154-96. Hair on arms and legs seemed increased, resembling that of a male. Hands and feet very clubby and thickened.

X-ray examination of the skull showed a greatly enlarged sella with the posterior clinoid processes practically destroyed. The basal metabolic rate prior to operation was +17 per cent. (Fig. 2.)

The operation by Doctor Davis was reported as follows: "The bone near the vertex was quite thick; in fact, measured about one inch. The diploe was very vascular. The right optic nerve was soon visualized. It was extremely flattened out over a purple domed tumor mass which pushed upward directly against the chiasm and did not extend very far forward between the optic nerves; the left nerve was likewise very flat. The dome of the tumor mass was incised and immediately a large amount of soft degenerated tumor material, together with dark yellow



Acidophilic Adenoma and Hyperpituitarism.

Fig. 2. Mrs. F. H. A) Before onset; B) After 5 years of acromegaly; C) X-ray skull; note destruction of sella; D) Pre-operative visual fields.

fluid, escaped. The tumor collapsed and fell away from the chiasm. With a sucker and a curet the tumor mass was removed until the capsule had shrunken and was flattened. The nerves and chiasm were thus freed from pressure."

She made an excellent postoperative recovery and when dismissed from the hospital the fields of vision had enlarged remarkably. About two months later she began to menstruate again and a year and a half later was delivered of a normal baby boy. After the child was born menses resumed and continued regularly for two years, although the flow was scant; menstruation finally stopped again at 39 years. For several months following the operation she noticed that the size of her hands regressed considerably. Previously she had been unable to fold her hands together because of the thickness of the fingers but now she was able to do this. She continued to be active and feel well for four years.

Three years ago, five years postoperative, symptoms of hyperthyroidism, hypertensive heart disease and diabetes gradually became worse. Cardiac failure has occurred.

The endocrine findings at this time are as follows: Hypermetabolism (basal metabolic rate +52 and +27 per cent); blood cholesterol elevated (276 mgms. per cent); Wilder test normal (60 mgms. chloride per 100 c.c. of urine. This throws no light on hyperactivity of the adrenal cortex. The blood pressure has steadily climbed from the nearly normal preoperative level to that of malignant hypertension. Cardiac hypertrophy, coronary insufficiency and congestive failure are in progress. It may be suggested that this is evidence of hyper-function of the adrenal cortex. The sugar tolerance test demonstrates prolonged hyperglycemia suggestive of pituitary diabetogenic activity (fasting blood sugar 119, ½ hour 216, 1 hour 298, 2 hours 292 and 3 hours 172 mgms. Insulin tolerance does show some sensitivity; the blood sugar dropped from 120 to 75 mgms. per 100 c.c. of blood in three hours after 10 units of plain insulin were given. Gonadotropic function is undetermined as the amenorrhea at this time is probably the normal menapause usually associated with hyperactivity of the pituitary. Since the recrudescence of hyperpituitarism corresponds with the menopause it may well be due to the withdrawal of the opposition that the ovary normally has for the pituitary.

This case history illustrates the recurrence of hyperpituitarism after successful subtotal hypophysectomy. The operation has preserved her vision and was followed by a normal pregnancy. Thus, these are positive evidences of adequate surgery but, later, with normal menopausal ovarian regression, hyperpituitarism has recurred as evidenced by hyperthyroidism, hypertension and diabetes.

SUMMARY OF ENDOCRINE RESULTS

The endocrine data for the series of 25 patients are as follows: In the hypopituitary group, hypometabolism is the rule; four are extremely low, between —30 and —40 per cent; twelve are in the neighborhood of —20 per cent; this is the level usually found in hypophysectomized animals; two are near the zero per cent. level.

The blood cholesterol is significantly raised in all four patients with the lowest rates, indicating thyroid deficiency; however, in only six of of the larger group at —20 per cent. is it elevated, while in the remaining five it is normal, indicating that in these cases the hypometabolism is not associated with relative hypothyroidism. Thyroid administration would be of value in ten of these eighteen patients to judge by hypercholesterolemia.

Adrenal insufficiency was indicated by abnormally high chloride concentration in the urine at the termination of the Wilder tests in five of the hypopituitary patients and in one of the hyperpituitary group. Oddly, the two patients with the highest tests, as high as any found in fully developed Addison's disease, are in excellent clinical condition, carrying on normal lives. In addition, they do not have any abnormal skin pigmentation. This suggests that in some way the hypopituitary state under the usual conditions of life of these patients avoids the sodium depletion of the body that leads to the crises which occur in patients with Addison's disease. The depletion is demonstrated by the Wilder test but probably does not occur under ordinary conditions.

Consideration of the sugar tolerance curves brings out the expected lower curves, that is, greater tolerance to sugar in the hypopituitary group, but under the conditions present the flatness is rarely pronounced and the curves usually are entirely normal. Hence this test in such cases would rarely be of diagnostic value in establishing the hypopituitarism which is certainly present. The hyperpituitary cases, on the contrary, have a higher curve, that is, lower tolerance to sugar; this was most pronounced, of course, in the two patients with active acromegaly. Five of these seven patients have sugar tolerance curves that are abnormally high.

The insulin tolerance curves also brought out a distinct difference between the more or less deficient hypopituitary cases and the hyper-

pituitary cases. As was expected, the more hypopituitary patients had greater susceptibility to insulin. However, two of the patients in the least disabled group maintained the blood sugar unchanged throughout the test. In the hyperpituitary group, three of the seven cases were unaffected by the insulin. One of these patients, however, had a marked insulin effect in combination with a high sugar tolerance curve.

Sexual function and the condition of the sex organs indicated great deficiency in all of the hypopituitary cases except three. In these, normal gonadal development and function were maintained. In the hyperpituitary group two were normal; two women, in addition, had amenorrhea and hot flashes indicative of pituitary activity characteristic of the menopause; one male of the seven had impotence and atrophy similar to that of the deficiency group.

Clinical Conditions. Our experience indicates that the diagnosis of hypopituitarism associated with non-functioning pituitary or embryonal tumors is frequently missed. These tumors often produce irreparable cerebral damage and frequently extreme pituitary atrophy. The diagnosis would be made earlier if patients presenting signs of loss of sexual function and secondary sex characteristics were studied with this in mind. In women amenorrhea and obesity are early results; in men loss of libido and diminished beard growth occur in the incipient stage.

Hyperpituitarism may continue after operation and be difficult to control. The acromegalic process may cease. The persisting disability is due to hyperfunction of the subsidiary glands. The problem becomes one of controlling hyperthyroidism, diabetes and hypertension. If this does not occur, that is, if treatment successfully stops the hyperpituitarism the result is satisfactory. The energy production of the body and sexual function become adequate.

CONCLUSION

Systematic endocrine studies have shown that after subtotal hypophysectomy in patients who have suffered from hypopituitarism, the deficiency of the subsidiary glands can be measured. In such patients who have had hyperpituitarism the persistent over-activity of the subsidiary glands may be demonstrated.

Such quantitative studies furnish a basis for accurate endocrine treatment in a group of surgical patients that have hitherto been neglected.

TREATMENT OF VARICOSE VEINS: FILLING THE GREAT SAPHENOUS SYSTEM THROUGH A URETERAL CATHETER

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For the purpose of therapeutic attack varices of the legs are divided into four groups:

1) Varices of the great saphenous system with a negative Trendelenburg test;
2) Varices of the great saphenous system with a singly positive Trendelenburg test;
3) Varices of the great saphenous system and of the deep perforating veins with a doubly positive Trendelenburg test;
4) Varices of the small saphenous system.

Positive Trendelenburg reactions indicate various degrees of valvular incompetence. The singly positive reaction is obtained when the saphenous valves alone are incompetent and the doubly positive reaction is obtained in the presence of combined saphenous and perforating valve incompetence.

In the performance of the Trendelenburg test the veins of the lower extremity are emptied by elevation of the leg in the supine position. A tourniquet is applied at the groin and the patient stands, with the proximal end of the vein thus obliterated. If the perforating valves are not competent, the saphenous system will fill rather quickly from below, thus indicating a flow from within outward through the perforators. This is a reversal of normal flow. If the perforating valves are competent, the saphenous system will fill very slowly from below. Incompetence of the saphenous valves is indicated by sudden filling of the saphenous system from above downward at the moment the tourniquet applied to the groin is released. Incompetence of the perforating venous valves is rarely present when the saphenous valves are competent. Incompetent saphenous valves, however, are not always accompanied by incompetent perforating valves.

The result of saphenous valvular incompetence is increased venous pressure; blood flow at the saphenofemoral junction is reversed and

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the long column of blood extending from the lower end of the saphenous vein to the right auricle is without valvular support.

Reversal of saphenous blood flow begins at the saphenofemoral junction. Blood travelling upward in the femoral vein spills down into the saphenous, from whence it takes a course through the perforators and back into the deep veins (figure 1). A vicious circle is effected with the production of marked supervenation of the blood in the leg. Edwards[1] has recorded pressures as high as 80 mm. of mercury in the presence of varices with valvular incompetence.

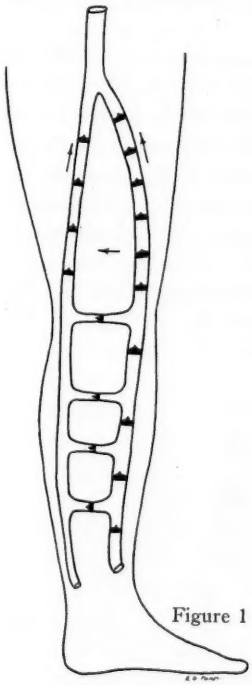

Figure 1

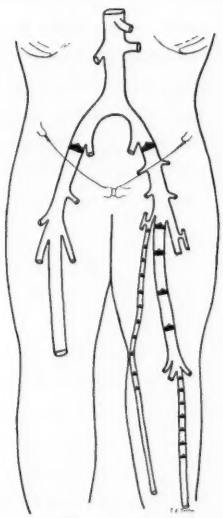

Figure 2

The saphenous valves play a very important role in the ascent of blood from the foot to the right auricle, the ten to twelve pairs of valves in the thigh breaking the long column of blood at the groin. Normally, there are no important valves interposed between the saphenofemoral junction and the heart* (figure 2).

In the presence of valvular incompetence, obliteration of veins by sclerosing agents cannot have a permanent effect because the high venous pressures will bring about recanalization of the obstructing thrombi. Under the pressures ordinarily encountered in medium and large leg varices, recanalization may appear within two to three months. Pratt[2] reports forty to sixty per cent. recurrence of leg varices in two to three years following simple injection. Small capillaries appear in the thrombi and coalesce to reform the lumen of the vessel. The higher the venous pressure, the more rapidly are channels forced through the newly formed capillaries.

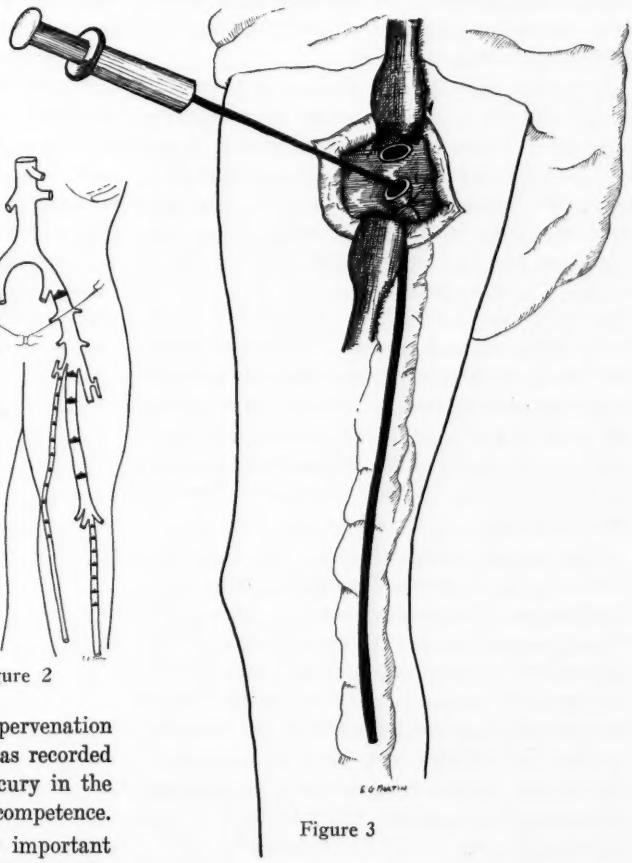

Figure 3

In the presence of valvular incompetence, the obliteration of varicosities by sclerosing agents must be supplemented by some procedure that will bring about a reduction of pressure in the saphenous system. This is accomplished by surgical obliteration of the saphenous vein in the thigh as high as the saphenofemoral junction.

The vein is ligated at its junction with the

*Venous valves: inferior ven cava, none; common iliac, none; external iliac, one; but usually insufficient; femoral, 4 to 5 pairs; great saphenous, 10 to 12 pairs; small saphenous; 6 to 10 pairs.

femoral, and a section of saphenous, two inches in length, is removed. Since recanalization may occur in a simply ligated vein, the excision of the proximal few centimeters is practiced. Any collateral veins joining the proximal three inches of the saphenous vein are ligated. The three branches usually encountered are the superficial external pudendal, the superficial inferior epigastric and the superficial external circumflex iliac. High ligation of the saphenous, together with excision of its terminal portion, was advocated by Homans in 1916[3].

Complete obliteration of the saphenous system in the thigh has been produced by the retrograde injection of sclerosing solution in volumes ranging from twenty to sixty cubic centimeters†. Up to the time of introduction of the ureteral catheter method by Pratt, the entire volume of sclerosing solution was injected into the distal stump of the saphenous vein. As the solution entered the vein lumen it was milked downward in the leg by manual pressure. Pratt[2] advocated the introduction of sclerosing solutions through a ureteral catheter inserted into the distal stump for a distance of forty to sixty centimeters (figure 3). We have had no difficulty in insinuating the tip of the catheter to a hand's breadth below the knee.

The ureteral catheter method has been followed by a much more diffuse and a much evener distribution of sclerosing solution throughout the saphenous system. The entire system is thus subjected to a much more uniform concentration of sclerosing substance. Because of dilution of the sclerosing solution by the blood, the intensity of chemical phlebitis will decrease proportionately to the distance from the point of injection. Following the suggestion of Pratt, pools of five cc. of sclerosing solution are deposited at intervals along the vein as the ureteral catheter is withdrawn.

We have used this method since its introduction by Pratt and we have been pleased to find a greater and more uniform obliteration of the saphenous system. The number of local injections following ligations has been very considerably reduced by this method.

Perforating veins with incompetent valves are indicated by the doubly positive Trendelenburg reaction. The exact location of the perforator, or "blow out," is determined by the use of a double tourniquet test. After the saphenous system has been emptied of blood and the thigh tourniquet has been applied, an elastic band of three-inch width is applied to the leg. As the edge of the elastic band is rolled back, the point of blow out is indicated by rapid local filling. Occasionally it becomes necessary to inject skiodan into the saphenous vein and thus locate the incompetent perforator radiographically. Incompetent perforators are treated by local ligation.

Varices of the small saphenous vein, no matter how large, can be treated successfully by injection alone. The reason for this is the absence of the factor of increased pressure which is of such great importance in relation to the great saphenous vein. The termination of the small saphenous is protected by a heavy layer of fascia two or three inches in length. The vein submerges beneath this fascia to enter the popliteal and the deep femoral veins (figure 4). In addition, the

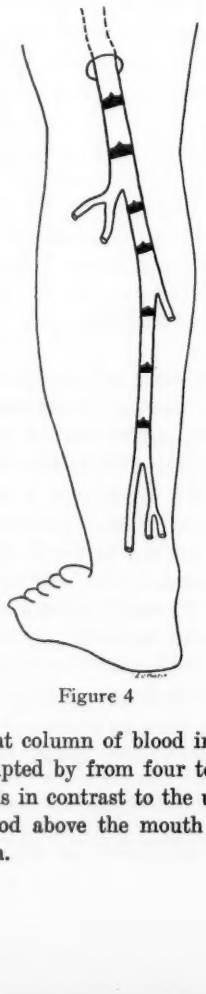

Figure 4

superincumbent column of blood in the femoral vein is interrupted by from four to six pairs of valves. This is in contrast to the uninterrupted column of blood above the mouth of the great saphenous vein.

Injection alone will suffice in the treatment of varices of the great saphenous vein when the Trendelenburg test is negative. The element of increased presure is not present when the Trendelenburg test is negative. Ligation and retrograde injection, therefore, are not required.

In summary, the methods of treatment indicated for the various classes of varicose veins may be listed as follows:

1) Varices of the great saphenous with negative Trendelenburg test: — multiple local injections of sclerosing solution. Recurrence is not to be expected because the saphenous valves are competent, and the factor of increased venous pressure is not present.
2) Varices of the great saphenous with singly positive Trendelenburg tests: — ligation at the saphenofemoral junction with retrograde catheter injection of large quantities of sclerosing solution. This procedure is followed later by local injections as necessary.
3) Varices of the great saphenous with doubly positive Trendelenburg, indicating incompetent perforators: — saphenofemoral ligation and retrograde injection combined with local ligation of the perforators. These procedures are followed by local injections as necessary.
4) Varices of the small saphenous: — multiple local injection. Recurrence is not to be expected because of the absence of the factor of increased venous pressure.

The method suggested by Pratt for retrograde injection of large quantities of sclerosing solution into the saphenous system through a ureteral catheter is advocated. When the sclerosing solution is pooled at regular intervals throughout the saphenous system, a much wider and a much more uniform obliterative phlebitis is obtained.

†Varisol (Abbott).

BIBLIOGRAPHY

1. Edwards, Edward A.: The treatment of varicose veins, Surg., Gynec. and Obstretrics 59: 916, 1934.
2. Pratt, Gerald H.: Surgical treatment of varicose veins and ulcers by segmented sclerosis, Am. Jour. Surg. 44: 31, 1939.
3. Homans, John: The operative treatment of varicose veins and ulcers based upon a classification of these lesions, Surg., Gynec. and Obstretrics 22: 143, 1916.

SPLENIC EXTRACT IN GLAUCOMA

(Preliminary Report)

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This is not intended to be a comprehensive laboratory report on the reaction of the different animals usually used for experimental purposes, but a report of a clinician's observations, tabulated recording and his personal deductions on the use of spleen extract for the various types of glaucoma in the human being.

Our medicinal attack up to very recent years has been almost limited to the use of eserine and pilocarpine, although many drugs had been used in the past. More recently the synthetic preparations, e.g. Prostigmin, mecholyl and doryl have been used with more or less success. I used acetylcholine intramuscularly 15 years ago but found its value so fleeting that I did not report it. The various preparations of the suprarenal glands, e.g. epinephrin and cortin and the synthetic preparations e.g. ephedrin, benzedrin and other similar preparations, have likewise found some favor. Of this very small group, the pharmacology of which we are just beginning to understand, eserine and pilocarpine are still the most dependable.

Many of us feel that the mechanics involved in the use of these miotics is the contraction of the pupil, thereby freeing the drainage angle and permitting an increased aqueuos escape into the canal of Schlemm. For some time past some of us have felt that the reaction of the neurovascular system to these preparations was the important factor, freeing of the drainage angle a secondary factor. More recent reports on the pharmacology of these drugs seem to indicate a selective influence on the nerve terminals through a chemical media on the effector or secretory cells that seems to offer a better understanding of the mechanism involved.

In 1937, Paul & Miller called attention to the use of spleen extract in glaucoma, reporting brilliant results in a number of cases. The claims made were so impressive that an investigation of the subject seemed worth while. Although tonometric readings, detailed visual recordings and perimetric studies were not reported there was disclosed sufficient information

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to warrant its trial in view of the fact that it was not attended with any unfavorable reactions.

Some of my experiences with this preparation were nothing short of the dramatic and one could in a measure understand the earlier enthusiastic report. However as my observations broadened, I soon learned that the results were not always so brilliant nor favorable, nor always uniform but never harmful. It left one with the impression that here was a preparation which apparently had virtues that we did not understand and probably did not know how to use and certainly required further study and observation.

In the beginning I used small doses of 1 and 2 c.c., gradually feeling my way and later used the larger doses up to 20 c.c., suggested by the authors but found that the 2 or 3 c.c. doses were just as efficient in my hands. After using the preparation for about 6 months, I came to several conclusions which I felt should be confirmed by someone else preferably by one in another city. I therefore had some spleen extract sent to Dr. Leudde of St. Louis with my assurance that it was a perfectly safe preparation to use. His first report was enthusiastic, (by telegram) later correspondence was less so, still later we agreed that it had definite virtues, virtues which were, however, not always predictable nor always maintained.

It was nevertheless impossible to dismiss the cold fact that an intra-ocular pressure of 60 or 70 mm of mercury by Schiotz was brought down to the 20's in a few hours nor could one dismiss the fact that this observation was repeated again and again, regardless of the fact that we could not explain why it did or did not do so.

It was very evident that we had in spleen extract a valuable addition to our very limited array of therapuetic methods of attack that might be of extreme value under certain conditions.

Comment. After using the preparation for some time, I felt that I was justified in making the following general statement:

1. That the injections, although harmless, had to be repeated and that later these injections were not followed by the same rapid fall in pressure. Where the pressure was high when first seen, the fall was greater and it never reached the same height again in my experience.

2. In moderately elevated pressure the fall is not so great.

3. In several acute cases of the secondary type, the result was not encouraging.

4. Frequent tonometric readings disclosed in some cases what appeared to me as a delayed reaction in the moderately elevated cases, that is, the drop was noted 2 or 3 days later, then a slight rise followed by another drop.

5. Probably the most interesting observation and I believe very important, was the resuscitation of the pilocarpine value where that drug had been used for a long time and had lost its earlier efficiency.

6. That the spleen preparation alone now available cannot be depended upon to maintain a lowered intra-ocular pressure but must be combined with the local use of pilocarpine and occasionally eserine. That is, it appeared to me to act as a synergist to these drugs, especially pilocarpine. Its joint action with prostigmin or mecholyl did not appear to me to be so favorable, however my experience with the use of these latter drugs is more limited.

7. That spleen extract is not a cure for glaucoma, but in many cases where the pressure although not reduced to the desired level, brought about a feeling of ocular well-being and visual improvement that was distinctly advantageous.

The manner of its action, the channels through which it acts still remains an intriguing question unexplained. The pupils do not seem to be influenced to any degree, therefore our concept of a miotic pupil being advantageous is here absent. In the favorable cases, the pressure goes down rapidly, the cornea clears and vision improves and the pupil reacts with more agility. It would seem therefore that the purely mechanical theory must here be dismissed and there is left to us the possible explanation on the basis of its direct or indirect influence on the neurovascular system possibly through a chemical media.

A review of the America ophthalmic literature in relation to spleen is almost nil, most of this literature is confined to its value in the various dermatose[1] and the conditions frequently ascribed to an allergic background. The foreign literature in its relation to ophthalmology is likewise nil as far as I have been able to ascertain. The general literature and experimental reports pertaining to its influence on the autonomic nervous system gives us some informa-

tion that may be applied to the explanation of the reactions we have noted in the eye.

Schliephake and Krohnson[2] in 1931 reported the use of a choline-bearing spleen extract and a choline-free extract in some gastric secretion experiments. It seemed to them that the spleen used, exerted a regulatory influnce upon gastric acidity by way of the sympathetic nervous system.

Berzone R. O.[3] reported good results in eczema, prurigo, and urticaria. Others have made similar reports. Mayer and Concorps[4] claimed favorable results in skin diseases associated with eosinophilia.

Asher[5] was one of the first to report a connection of the spleen with the endocrine system, he noted an association between the spleen and thyroid. He found that after thyroidectomy the circulatory organs react more to choline and less to adrenaline and spleenectomy produced the opposite effect to a degree. If a normal animal receives an injection of choline, the blood pressure drops for some time, the pulse slows up and returns to normal after a given time. This we believe, he states to be an irritation of the vagus, the adequate stimulant of which is choline. If the same animal is injected a second time after 5 minutes, the reaction is not so strong. After thyroidectomy the reaction is much stronger and an injection of choline that the normal animal could well stand, may now kill this animal. They then spleenectomized these animals and the irritability was much reduced and they are led to believe that spleenectomy in a measure neutralized thyroidectomy. I recall seeing a case of acute bilateral glaucoma in a young man following a thyroidectomy a few days previous.

Maurer K. further refined the spleen extract which he called prospleen and which he states contains two active factors. One has a regulatory effect upon the vegetative system and the other increases phagocytic activity of leukocytes.

One author sums up the use of spleen with the opinion, that injections of spleen have quite different effects upon different individuals and the reaction in disease is quite different than in the normal.

In 1938, Schliephake[7] restates his earlier reports as follows: "The influence of the spleen on the sympathetic nervous system can be better understood through studies of the interrelation of the spleen and thyroid." The thyroid secretion reduces vagal irritability. Thyroidectomy is followed by greatly increased vagal irritability and a decreased irritability of the sympathicus. He has found that after spleenectomy, phenomena produced by throidectomy may in part be reversed; thus is demonstrated a splenic influence on the parasympathetic system analogous to the influence exerted by the thyroid on the sympathicus.

One is impressed with the frequent reference to the choline-like and adrenalin-like substances in relation to the autonomic nervous system in these experimental reports. The literature continuously calls attention to the splenic influence on the parasympathetics and the apparent thyroid influence on the sympathetics.

Myerson and Thau in their paper on Human autonomic pharmacology in 1937, (Archives of Ophthal.) state that the intra-ocular tension is, in certain respects, a resultant of the balance between cholinergic stimulation, choline esterase and adrenergic stimulation and closely corresponds to such functions as the heart rate and the secretions of the stomach. The pressure lessens with cholinergic stimulation and increases when the cholinergic substances are shut off as after the use of atropine or following adrenergic stimulation as in the use of benzedrine. In referring to the use of mecholyl they bring out a factor that seems pertinent to the subject. "The concentration necessary to bring about results on the eye varies from patient to patient remarkably, although this is true of the autonomic pharmacology of man in general. Likewise, the reaction to this group of drugs varies widely in health and disease. This statement can well be a summary of the action of splenic extract in glaucoma.

From this experimental evidence one may draw several conclusions, first, that the autonomic nervous system is in some manner influenced by the spleen probably through the parasympathetic system. Second that this influence does not express itself uniformly clinically which seems to be in keeping with the general status of autonomic pharmacology. It may well be that the extract now available contains certain fractions that does not always permit a predictable uniform reaction.

More recently a kidney extract[9] has been used

in the control of acute vascular hypertension based on the ischemic kidney theory of Goldblatt with more or less controversial reports both as to its value, its mode of attack and its lack of uniform reaction.

Still more recently has an extract of pancreas[10] been used for the control of spasm of the ureters in the presence of kidney stones which is extremely interesting. The thought being that the pancreatic extract relaxes the uretral spasm thus permitting the passage of the uretral stones.

All these reports are interesting but still indefinite although they do throw some light on our problem which likewise seems to be neither well understood nor the results uniform or predictable.

For many years I have held that glaucoma was a neurovascular disturbance and that the closure of the canal of Schlemm was a secondary complication which aggravated the free interchange of fluids but was not the cause of glaucoma. That an irritant of some type capable of producing a neurovascular reaction was in all probability the initial exciting factor that precipitated this cycle of events we call glaucoma.

I have not infrequently noted in the past two years, that a case that I had not seen for several months in which the pressure had gone up to the 40's, whether it was operated on or not operated on had or had not used pilocarpine regularly responded brilliantly to an injection of spleen extract.

Whether spleen extract acts through a chemical media as do the drugs belonging to the cholinergic group, e.g. eserine and pilocarpine or has some unique method of producing a reaction is a question that remains to be answered. It does seem that a new avenue of approach is being opened for the study of the glaucoma problem that offers much for the future.

SUMMARY

1. Spleen extract is not a cure for glaucoma.
2. It does reduce the intra-ocular pressure in some cases but does not maintain it and its action is not always predictable.
3. It is an excellent addition to our small group of drugs that influence intra-ocular pressure favorably.
4. It may well be that its greatest value is as a synergist to pilocarpine and eserine especially in the non-congestive type.
5. I have noted no ill effects from its use.

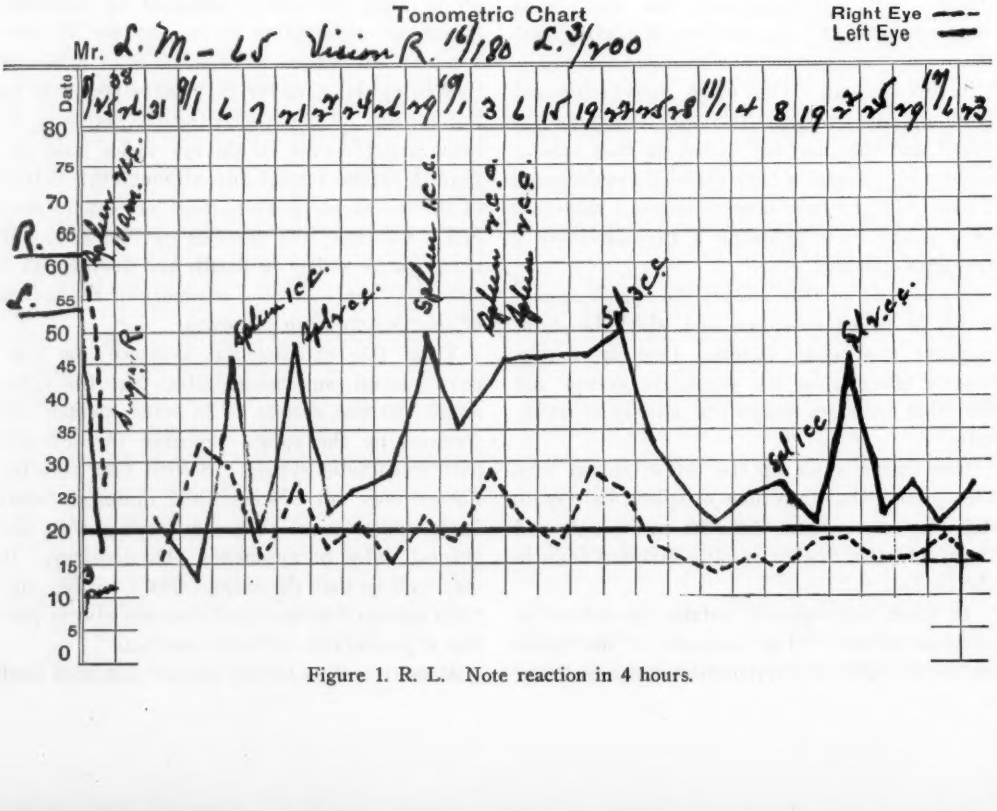

Figure 1. R. L. Note reaction in 4 hours.

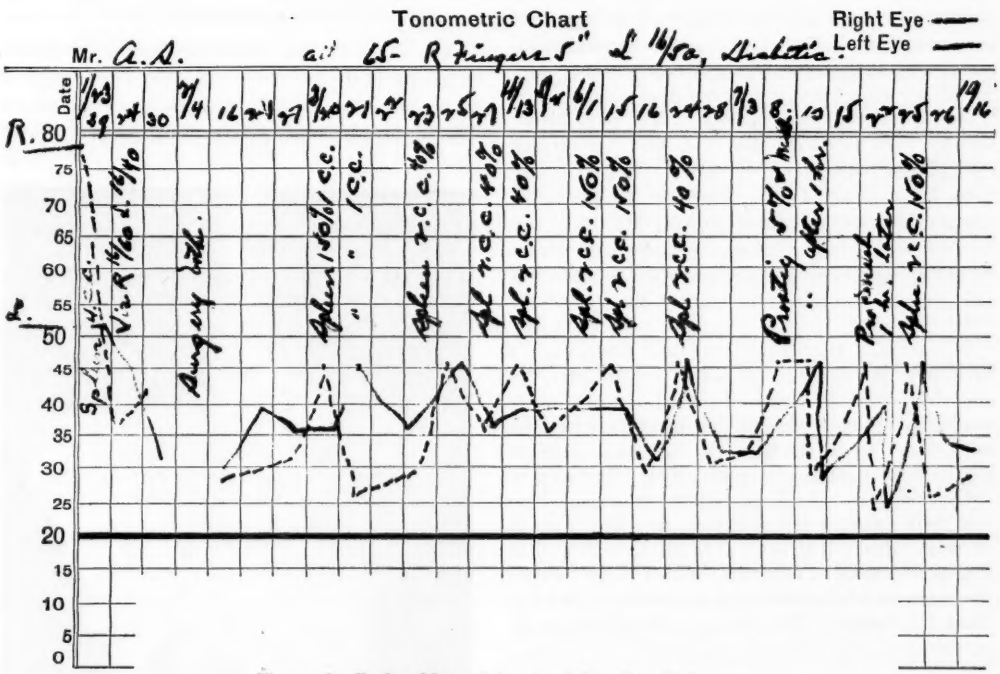

Figure 2. R. L. Note vision in right after 24 hours.

BIBLIOGRAPHY

1. Wien, Max S.: Arch. Dermatology & Syphilology, 97: 963, 1933, Brougher, J. C.: Effect of desiccated spleen & spleenectomy on serum calcium in normal & Parathyroidectomized Dogs, Am. J. Physiology 92: 648, 1930.
2. Schliephake, E. &: The influence of spleen substances upon gastric secretion, Deut. Arch. Klin. Med., 170: 30-50, 1931.
3. Borzone, R. O.: Arch. Nac. biol. y Med., 50: no 2-3, 1930.
4. Mayer n. Moncorps: Munich Med. Wochenschrift, 43: 1927.
5. Asher: Schweiz. Med. Wochenschrift, 57: 802, 1927.
6. Lauda: Physiology red Milz., Berlin & Wien, 1933.
7. Schliephake, E.: (Abstr.) J. A. M. A., 110: 1204, 1938.
8. Myerson & Thau: Arch. Opl. 18: 978, 1937.
9. Tigerstedt & Bergman: Skand. Arch. of Physiol. 8: 223, 1938.

DISCUSSION

Dr. Frederic Fenger (The Armour Laboratories, Chicago: By Invitation): Not being a practicing physician, I hesitate to discuss Dr. Goldenburg's clinical findings. Instead, I should like to amplify his remarks by telling you what little is known about the spleen as an organ, and all we know about preparing extracts from spleen tissue.

The reticulo-endothelial system is concerned with the production of new leukocyte cells and with the destruction of senile red corpuscles. This system is comprised of the liver, spleen, hemolymph nodes and the bone marrow.

The spleen is an organ consisting of a capsule with adequate framework supporting extensive blood channels. The channels are lined with reticulo-endothelial cells which remove from the circulation particulate matter such as bacteria. The framework also supports germinal centers from which lymphocytes take their origin.

The spleen, due to its accessibility and structure, lends itself for making specific tissue extracts.

When we were requested some years ago to prepare a spleen liquid suitable for parenteral use, we searched the literature, especially the German because spleen therapy in its present form originated in Germany. As usual, we found nothing pertaining directly to the manufacture of such a product. After due experimentation we developed a process which is briefly as follows:

Finely minced hog spleen tissue is mascerated with ten volumes of slightly acidulated distilled water at bacteriostatic temperature for eighteen hours. The aqueous extract is heated to 94° C in order to coagulate proteins and inactivate tissue enzymes; filtered and concentrated in vacuo, and then fractionated by means of alcohol. The 80 per cent alcohol soluble fraction is purified further by removal of phosphatides, cholesterol, etc. The final extract is evaporated to dryness, dissolved in distilled water, and made isotonic with sodium chloride. The 40 per cent. spleen liquid contains 6 mgm. of spleen extract per cc. derived from 0.4 gram of the fresh tissue. The 150 per cent. solution contains 22.5 mgm. per cc. representing 1.5 grams of fresh spleen. The spleen liquid contains chiefly extracts of lymphocytes and reticulo-endothelial cells.

The finished spleen liquid is tested for sterility, and also for toxic amines such as histamine, etc.

While we have not determined all the physical constants of the extract, we know that its total nitrogen content is 10.4 and amino-nitrogen 4.7 per cent. on the dry basis; that it contains di-peptides — that is two amino acids tied together — and some higher peptides such as tri-peptides; also that the nitrogen carrying molecule is rather small.

Since spleen liquid reduces edema, its application appears to have something to do, directly or indirectly, with the water balance of the body, or change the metabolism of the minerals so that the salts will pass out of the cells carrying with them excessive water.

Dr. Michael Goldenburg, Chicago (closing): I have only this to add. Do not expect miracles, but if a situation arises where an operative postponement would be desirable whether due to an unclean field, very high tension, glycosuria or an emotional upset, try it, it may save you much grief. In the non-congestion type, where pilocarpine or eserine have lost their value, a few injections of spleen may be of much value. It is not a cure-all but does give us one more avenue of approach through organ therapy, the value of which time alone can judge. I want to thank Dr. Fenger of The Armour Laboratories for his co-operation and supply of material.

STOMACH DIVERTICULUM — A CASE REPORT

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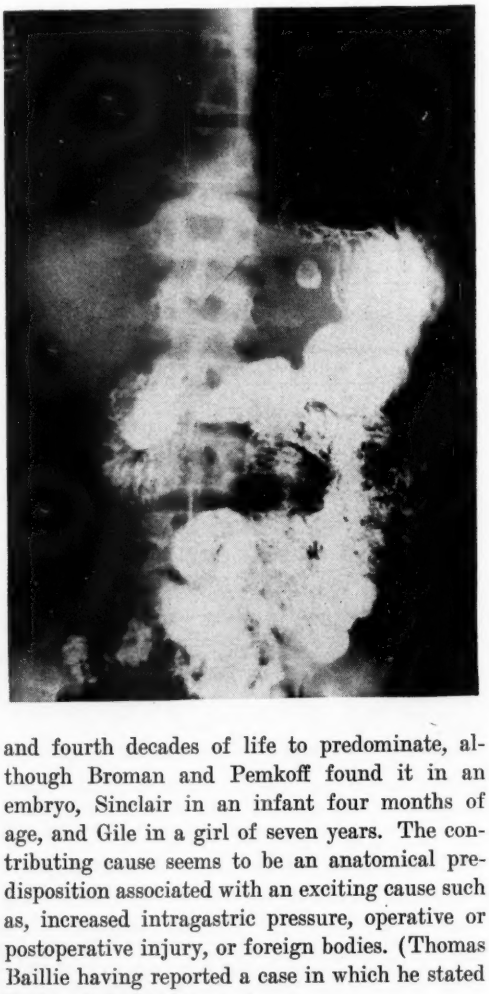
Helmont (1804) has been referred to by most writers as the first person to describe stomach diverticula; however, Lay Martin (1936) calls our attention to the fact that Moebius (1661) was really the first who wrote in regard to this condition. Other men, previous to the time of Helmont, have also written in regard to this, such as M. Eournier (1774) as a result of an autopsy, found such a pouch containing foreign bodies; Thomas Baillie (1793) in his "Morbid Anatomy of the Important Parts of the Body" London, Chap. VII, page 92, states: "a part of the stomach is occasionally formed into a pouch by mechanical means, although very rarely." The opinion is that he seems to have started the procession of recorded cases down to the present time with considerable discussion through the years as to the classification.

*From the Surgical Service, Dr. E. H. Warszewski at Cook County Hospital

ETIOLOGY

The condition has been reported in literature in all parts of the world and has been believed to be more common in females than in males. The majority of the case reports show the third



and fourth decades of life to predominate, although Broman and Pemkoff found it in an embryo, Sinclair in an infant four months of age, and Gile in a girl of seven years. The contributing cause seems to be an anatomical predisposition associated with an exciting cause such as, increased intragastric pressure, operative or postoperative injury, or foreign bodies. (Thomas Baillie having reported a case in which he stated he found five half-pence).

LOCATION AND PATHOLOGY

Martin reports that most cases have been described to be along the greater curvature of the stomach, having tabulated 61 per cent along the greater curvature and 31 per cent along the lesser curvature.

True diverticulae are classified as those which contain all the layers of the stomach and are supposedly due to a congenital weakness of the musculature, while false, traction, pulsion or

acquired diverticulae are those which are the result of disease factors or trauma.

Pancreatic inclusions, according to Martin and others seem to be of significant import, inasmuch as fourteen cases were reported to have contained such tissue, and he cites Broman who feels "that they are dilated excretory ducts of hypertrophied pancreatic islands whose acini have not been developed normally." Such a conclusion is sound, especially if the diverticulum is situated near the pylorus. F. B. Lund, in 1928, reported a case of diverticulum of the fourth part of the duodenum which had at its base an accessory pancreas. Tumors of malignant nature along with ulcers have been reported.

Intrinsic and extrinsic trauma must be given consideration. Mechanical injuries by foreign bodies swallowed by children have been reported. A case of traumatic rupture of the stomach observed was interesting from the standpoint that at the site of the rupture along the greater curvature near the cardia, there was a small pedicle which, however, was so obliterated by the inflammatory process that followed, that further study was impossible. No case of rupture of the diverticulum of the stomach has been reported but the majority have a small pedicle.

The associated pathology includes the presence of ulcers, neoplasms, foreign bodies, etc., and A. B. Rivers, et al., report associated pathology in 30 per cent of their cases, three of their fourteen cases being associated with diverticulae elsewhere in the gastro-intestinal tract. It has been pointed out by Berg and Albrecht that longitudinal folds of mucosa enter and pass through the stalk of the diverticulum and they claim the presence of these folds to be pathogneumonic.

The symptoms are variable, and to a great extent depend upon the size of the opening at the base, those with a large opening emptying more readily than the narrower type and less apt to be productive of acute symptoms, while those with a narrow lumen at the base tend to constrict and keep the contents within the sac for a long time and lead to infection of the sac, producing a diverticulitis, with symptoms of "surgical belly" which might simulate forme-frust ulcer or the like. Barium has been demonstrated by Ewert and Cardiner to have remained for ten days. As a general rule, the patients complain of indigestion, gas, distention, belching, epigastric discomfort and pain which usually comes on after meals, some of which is relieved by food, so that the condition is frequently suggestive of ulcer. Bleeding with severe hematemesis is not an impossibility and tarry stools may be present.

Diagnosis of diverticulum of the stomach may be very difficult but can be summarized by quoting Rivers who states: "It is probably the only justified diagnosis when the x-ray findings are consistent, and the patient has epigastric distress which is not attributable to any other disease."

Medical treatment has included the use of alkalies, belladonna and dietetic observation, while some have advocated postural treatment. However, the latter has been reported to be effective in cases with large pedicles, which incidentally are productive of the least symptomatology. Inasmuch as cases along the lesser curvature and on the posterior surface of the stomach not infrequently are associated with some inflammatory process and may become formidable, conservative management should be looked upon favorably, but failing in this, surgery should be instituted. The surgical treatment has consisted of excision of the diverticulum to mere inverting of the pouch with suture of the base. In the presence of associated pathology, however, partial gastrectomy with enterostomy may have to be resorted to. Difficulty in finding the diverticulum is generally due to inaccessability to the operative field and collapse of the walls (Albrecht).

A CASE REPORT

B. R., a white male was admitted to the Medical Service on January 24th, 1938, with an admittance diagnosis of G. I., pathology. There was a history of pain in the abdomen for two weeks and vomiting of four days' duration.

Onset and Course: Patient stated that until two weeks before admittance he had been apparently well, when he had some pain in the lumbar region which radiated to both lower quadrants, was "griping" in character and lasted five to ten minutes. Four days before entrance he started to vomit and he noticed that the vomitus contained blood. Following the vomiting he felt better, but since that time was unable to retain food. Tarry stools were noted in the past four days and a loss of weight of eight pounds in two weeks was reported.

Past History: The patient had G. C., some years previously but there were no illnesses nor injuries. The family history was negative. The investigation of his habits revealed that the patient had been drinking a half pint of alcohol daily for the past two years.

Physical examination revealed a fairly well developed white male, 38 years of age who did not

appear acutely ill. Temperature 98; pulse 84; respirations 24, and blood pressure 148/96. The head, chest, and upper extremities were negative. The abdomen was flat but examination at this time was unsatisfactory because of marked voluntary rigidity with tenderness in the right upper quadrant and both lower quadrants. The liver, kidney and spleen were not palpable. Rectal examination revealed small, firm, smooth prostate. There were no masses or blood. The skin contained numerous patches of a scaly eruption. Following this brief work on admittance the Medical Service considered acute appendicitis, alcoholic gastritis, G. I. malignancy and peptic ulcer. Three days after admittance the pulse was 100, temperature 100 and there was tenderness localized to the right lower quadrant being localized abdominally and rectally. White blood count was 25,000. Icteric index 5. Wasserman and Kahn tests were negative. The x-rays of the chest and colon were negative, and the urine examination and culture were likewise negative. Stomach analysis revealed: free acid 22, total acid 35, combined acid 13. There was no chemical blood in the contents. On January 26, 1938, stool examination revealed mucus and blood (Chemical). On admittance to the Surgical Service on January 27, 1938, anorexia and vomiting were still present. The patient had three watery bowel movements and the pain in the right lower quadrant was more severe. An Ewald meal was administered and following this the patient ate several meals without vomiting, but stated the pain was aggravated by deep inspirations.

In view of the conflicting symptomatology and negative findings the patient was treated conservatively and on February 3rd, 1938, a barium meal was administered and the x-ray report No. 10,910 of the same date "reveals a constant barium-filled niche in the lesser curvature of the pars caria due to a diverticulum of this region. There is no evidence of intragastric pathology."

X-ray number 13,925 taken on February 18, 1938, "reveals the same diverticulum noted in the cardiac end of the stomach on previous examination." This was not visualized after four hours.

Explatory laparotomy was performed on February 25th, 1938, under local anasthesia and gas combination, through a midline, epigastric incision. Opening into the peritoneal cavity revealed extensive perigastritis and perispleenitis. The lesser curvature of the stomach was enveloped in dense adhesions and there were numerous adhesions between the greater curvature and the spleen. The spleen was about three times normal size and was adherent to the surrounding structures and was nodular in character, especially in the upper pole near the hilar margin. On exploration of the anterior and posterior surface of the stomach, numerouss adhesive bands were broken and when finally visualized, no palpable or visual diverticulum was demonstrated.

The appendix was then removed through a McBurney incision and the pathologist reported "Catarrhal Appendicitis." The patient progressed favorably and since the operation (ten months) there has been no recurrence of symptoms or pain and repeated x-ray examinations fail to demonstrate the diverticulum so persistently visualized before operation.

COMMENT

1. Whereas congenital or true gastric diverticulae are not very common, the false or pulsion type of diverticulum of the stomach is not uncommon, as has been demonstrated by repeated radiographic examinations.

2. The symptoms may be very indefinite and confusing.

3. This was a case of pulsion or acquired diverticulum due to adhesive bands from a perigastritis and perispleenitis (perhaps of alcoholic origin).

BIBLIOGRAPHY

1. G. Chaney and R. R. Newell: Amer. Journal Diag. Diseases and Nutrition, 3: 920-923, 1937.
2. Palmer E. Wigby: 2 cases Texas State Jr. Med. 33: 43 to 46, 1937.
3. Amer. Journal of Roentenology, 38: 280-288, 1937.
4. R. J. Payne: Two cases, British Medical Journal, 2: 968-69, 1936.
5. L. Nathanson and M. Steiner: At Cardiac End; end case report with duodenal ulcer, 26: 326-330, 1936.
6. G. A. Ewert and G. R. M. Cardiner: Report of case before and after operation. British Jr. Surgery, 530-536, 1936.
7. J. M. Bonnar and B. Kaplan: Diverticulum of Cardiac End, American Journal of Roentgenology, 34: 351-353, 1935.
8. A. B. Rivers; G. A. Stevens and B. R. Kirlin: S. G.
9. E. B. Freilich; G. Danelius and G. C. Coe: Amer. Jr. Digest, Diseases and Nutrition, 2: 252-254, 1938.
and O. 60: 106-113, 1935.
10. F. Cunlia: Amer. Jr. Surgery, 27: 252-266, 1935.
11. E. A. Schmidt and P. H. Guttman: Multiple diverticulae of jejunum and duodenum simulating gastric diverticulae and complicated by cholecystitis, American Jr. Roentgenology.
12. S. Weiss: Medical Jr. and Record (Supp), 121: 768-770, 1925, Illustr.
13. I. Gray: Diver. of Stomach accidental finding in routine examination, 14: 110-113, August 1925.
14. E. P. Pendergrass: Of upper end Surg. Cl. N. Amer. 11: 1493-1496, 1931.
15. J. F. Gile: New England Jr. Med. 1931, 204 268.
16. Geyman J.: Case report, Cal. and Western Med. 23: 813, 1930.
17. Allen W. B.: Congenital Div. Greater Curv., Canadian Med. Assoc. Jr. 33: 43, 1930.
18. Liljedahl, F. L.: Case report, Amer. Jr. Roent'g. 22: 258, 1929.
19. Sinclair: Congenital Div. Stomach in Infant, Brit. Med. Jr. 17: 182, 1929-1930.
20. Goodwin, P. B.: Diverticulum Stomach, Ill. Med. Jr. 54: 444, 1928.
21. Kalbfleisch, W. K.: Amer. Jr. Roentg. 20: 224, 1928.
22. Moynihan B.: Div. of Alimentary Canal, Lancet 106: 1927.
23. Pearlstein, F.: Div. of Cardia, Med. Jr. Record 124: 134, 1926.
24. Lawson, J. D.: Report Case Gastric Cancer, Radiology, 6: 518, 1926.
25. Thompson, J. W.: Brit. Jr. Surgery, 14: 180, 1926-1927.
26. Tupper, E. E.: Div. of Stom. Review of Literature and Case report, Wise Med. Jr. 10: 901, 1923.

ONE HUNDRED (100) CASES OF ARTHRITIS TREATED WITH A COMPARATIVELY NON-TOXIC GOLD COMPOUND

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CHICAGO

The reports of Jacques Forestier[1]; Hartfall, Garland and Goldie[2]; Copeman and Tegner[3]; Parr and Shipton[4], in British medical journals clearly indicate the value of gold salts in the treatment of arthritis. In this country, Snyder, Traeger and Kelly[5]; Key, Rosenfeld and Tjoflat[6]; and Sashin and Spanbock[7] have confirmed the reports of the British authors. Both the British and the American workers have pointed out the serious and even fatal reactions which may occur at any time during the treatment with gold salts. Like many others, we had hoped for a gold preparation that was of such low toxicity that it could be safely used in the treatment of arthritis.

A report from the Department of Physiology of the University of Chicago, "The Toxicity of the Colloidal Sulfides of Some Heavy Metals for Rabbits" by G. E. Wakerlin, M.D., and Chas. Eiseman, M. S. (Am. Jour. of Syphilis, Vol. XII, No. 3), clearly showed that Colloidal Gold Sulfide-Hille was of very low toxicity as indicated by the high lethal dose for rabbits. The maximum tolerated dose proved to be 250 mg. per kilo, the minimum lethal dose, 300 mg. per kilo (Table I). Using 1/10th of the theoretical dosis tolerata for dogs, three doses were administered intravenously to two dogs, one anesthetized with barbital and one with ether, without producing any change in the respiration, blood pressure or heart action in a three-hour observation period.

TABLE I.

Dose of Compound per Killogram	Number of Rabbits	10-Day Observation Period: Number Lived	10-Day Observation Period: Number Died	Survival in Days After Injection
100 mg.	1	1	0	
150 mg.	1	1	0	
200 mg.	1	1	0	
250 mg.	5	4	1	2 days
300 mg.	4	2	2	1 day

Aurol-sulfide, a stable, aqueous solution of colloidal gold sulfide (Au_2S_2) contains in the 0.5% solution used in this study, 4.35 mg. of gold and 0.65 mg. of sulfur per cc. As a preservative, the parenteral solution contains 0.2% cresol, and the oral solution 10% alcohol.

The commonly used gold salts are Sanocrysin (gold-sodium-thiosulfate) containing 374 mg. of gold and 240 mg. of sulfur per gram, and it is used intravenously; Myochrysine (gold-sodium-thiomalate) containing 505 mg. of gold and 82 mg. of sulfur per gram. It is used intramuscularly.

Mollgaard, cited by Wakerlin, gives the tolerated intravenous dose of Sanocrysin for rabbit at 40 mg. (15 mg. of gold) per kilo. Wakerlin reported 250 mg. of Aurol-Sulfide (217.5 mg. of gold) as the maximum tolerated intravenous dose for the rabbit per kilo. By comparison, therefore, fully six times as much Aurol-Sulfide may be administered to rabbits as Sanocrysin, or figured as metallic gold, a ratio of 14½ to 1. This ratio indicates that colloidal gold sulfide is relatively non-toxic when compared with the crystalloidal salts of gold and one may give larger quantities of the actual gold by employing the colloidal salt.

With the knowledge that Auroli-Sulfide was of such low toxicity for animals, we began the use of this drug cautiously at first, in a series of well selected cases of arthritis. These patients were checked and re-checked according to a definite plan and routine laboratory tests were done on all these patients. Frequent blood counts were done and repeated urine analyses were made during and after each series of treatments. No variation from normal in either the blood counts or urines in this series of one hundred patients was noted.

The purpose of this preliminary report is to evaluate the toxic effect of Aurol-Sulfide on this group of 51 atrophic and 49 hypertrophic cases of arthritis. These cases are grouped according to the amount of the gold used in treatment and indicate the great care that was used in determining the toxic dose.

GROUP I: 48 cases treated with from 9 to 183 mg. of gold; an average of 150 mg. of gold per patient. This average is equal to 300 mg. of Myochrysine, or 405 mg. of Sanocrysin.

GROUP II: 25 cases treated with from 208 to 365 mg. of gold; an average of 291 mg. per patient. This average is equal to 582 mg. of Myochrysine or 772 mg. of Sanocrysin.

GROUP III: 27 cases were treated with from 392 to 1044 mg. of gold; an average of 586 mg. per patient. This average is equal to 1172 mg.

of Myochrysine, or 1582 mg. of Sanocrysin.

The only toxic reactions noted were in two (2) patients who were also receiving injections of bismuth and arsenic while under gold sulfide therapy. When either the bismuth or the gold sulfide was withdrawn, the nausea and vomiting which manifested itself, ceased, only to reappear when both metals were again given simultaneously. These cases reacted after the first dose of Aurol-Sulfide. That only two (2) cases of the one hundred (100) studied manifested toxic reactions to Aurol-Sulphide, seems to support Wakerlin's claim for the safety and low toxicity of Aurol-Sulfide, especially when compared with the toxic reactions from the crystalloidal gold salts observed by the following authors:

Key, Rosenfeld and Tjoflat reported 44 toxic reactions in 70 patients (63%)
Crawford reported 12 toxic reactions in 27 patients (44%)
Hartfall and Garland reported 377 toxic reactions in 900 patients (42%)
Parr and Shipton reported 18 toxic reactions in 70 patients (26%)
Copeman and Tegner reported 11 toxic reactions in 51 patients (21%)
Sashin and Spanbock reported 4 toxic reactions in 22 patients (18%)
Snyder, Traeger, and Kelly reported 17 toxic reactions in 100 patients (17%)
This totals 483 reactions in 1240 patients (39%)

Although, in this first series, our primary purpose was a study of the degree of toxicity of colloidal gold sulfide, we observed that even from relatively small dosage many of these patients showed improvement and that the improvement was greater when larger doses of gold were used. We have felt, therefore, that from the standpoint of therapy, proportionately larger doses of Aurol-Sulfide would give correspondingly better results. In our second series now under study as to the therapeutic efficacy of Aurol-Sulfide, the administration of considerably larger doses intravenously is bearing out this contention.

COMMENT

In a series of one hundred (100) cases we experienced only two (2) toxic reactions. This, together with reports from the literature referred to has convinced us that colloidal gold sulfide is relatively non-toxic. It may be argued that we experienced no severe reactions because the amount of gold used was relatively small. Though this may be true, it must be considered that many of the reactions reported from the use of the crystalloidal gold salts occurred in the first half of the first course, when the total dosage was generally below 300 mg. of gold.

Dr. R. Garfield Snyder[8] advised us that, at the Arthritis Clinic of the Hospital for Ruptured and Crippled in New York, minor reactions from Aurol-Sulfide total 8%. The chief symptom noted was itching, which disappeared in three to four weeks. Dr. H. J. Rosenfeld[9] also advised us that, at the Arthritis Clinic at Washington University, St. Louis, he has been able to satisfactorily continue gold treatment with Aurol-Sulfide in those patients who reacted seriously from Myochrysine.

We feel, therefore, that Aurol-Sulfide is a preparation of low toxicity and will eventually find its place among the safe therapeutic agents used in the treatment of arthritis.

SUMMARY

(1) 100 cases of arthritis were treated with a colloidal gold preparation, intramuscularly and orally, with only two slight reactions occurring in the group.

(2) It was noted incidentally that 21 (41%) of the atrophic group (51) and 19 (39%) of the hypertrophic group (49) were definitely improved for the period of this observation.

(3) This preliminary report will be followed by a detailed report of the therapeutic value of Aurol-Sulfide 2%, used intravenously in doses of 5 to 10 cc. The results in this latter group appear definitely more encouraging.

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Aurol-Sulfide for these studies was supplied by Hille Laboratories, Chicago.

BIBLIOGRAPHY

1. Forestier, Jacques: Rheumatoid Arthritis and Its Treatment by Gold Salts. Lancet, 1934, **11**: 646-48.
2. Hartfall, S. G., Garland, H. G., and Goldie, Wm.: Gold Treatment of Arthritis; a Review of 900 Cases. Lancet, 1937, **11**: 784-88.
3. Copeman, W. S. C., and Tegner, W.: A Review of Gold Therapy. Lancet, 1937, **1**: 554-57.
4. Parr, L. J. A. and Shipton, Eva A. Chrysotherapy in Rheumatoid Arthritis; Med. J. of Australia, **1**: 1937, pp. 864-74.
5. Snyder, R. G., Traeger, C. H. and Kelly, LeM.: Gold Therapy in Arthritis; Observations on 100 Cases Treated with Gold Sodium Thiosulphate and Aurocein; Annals Int. Med., **12**: 1673-81, 1931.
6. Key, J. Albert, Rosenfeld, H. J. and Tjoflat, O. E.: Gold Therapy in Proliferative (Especially Atrophic) Arthritis. J. Bone & Joint Surg. **21**: 339, 1939.
7. Sashin, David and Spanbock, Joseph: Intravenous Gold Therapy in Rheumatoid Arthritis. Med. Record, **95**: 429, 1937.
8. Snyder, R. Garfield: (Personal Communication).
9. Rosenfeld, H. J.: (Personal Communication).

MEDITATIONS ON MAN'S DEBT TO MEDICINE

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I should like to talk about man's debt to medicine were it not for the fact that our concepts of debts have changed so radically. Time was when we regarded a debt as an obligation that had to be paid, as a deferred payment that had to be met, as a deficit that had to be cleared; but today all such definitions have given way to the attitude implied in the Irishman's witicism that "a debt is spending money which you ain't got." We think of debt as a score which has to be settled than as an expenditure to be made on credit. We face with placidity a debt as insolvency; we contract, and we keep on owing; we borrow, and we outrun the sheriff. In fact, there is a certain fashion in being in debt. Business is run on credit, which is nothing else than the expression of the chance that people may pay a debt. In retrospect, our age may look to the observer who discovers the time-tube buried at the World's Fair as a civilization of debt-making, and yet there is still something real behind the concept of debt. We still like to think that we can secure a debt by notes or mortgages or other debts. But all these, be it remembered, are simply devices for pyramiding debts.

The doctor, too, holds a mortgage on society in the hope that some day that debt which society owes to him will be paid. I am not thinking of the payment of the doctor's bill; I am thinking rather of society's debt to the towering structure that is founded in the long buried facts of antiquity and that raises the pinnacles of its accomplishments into the skies of our human achievements. One might have talked of these things with greater confidence and assurance before it was necessary for us to become aware of the threat to those achievements, when we still believed that we had a civilization that would form a stepping stone to our next stage of progress. But today one cannot but be skeptical of all that is to come next. Now that we have seen mankind denuded of its trappings of artificiality and exhibited in all the mere naturalness of its barbarity, our attitude toward our debt looks like a vanishingly small pawn of interest in the great game for tyrannous dominance which is being played on the huge dimensions of the world's chess board of nations. And so we are brushing aside the trifles of life, and one of these is our obligation, our debt.

But despite this, after all cultural history is not at an end. It will change, no doubt, perhaps appallingly so; but as we emerged from the simple barbarities of the Trojan War to reach the cultural culminations of the thirteenth century, and as we emerged from the Asiatic invasions of Tamerlane to reach the philosophic glories and scientific triumphs of the nineteenth century; so, too, no doubt, mankind will emerge from the inglorious present to a future that will hold aloft again the triumphs of the human mind and the victories of man over himself. Will the debt of man to medicine then be acknowledged?

There is not an area of human life or interest to which medicine has not made its contribution. Into literature and representative and plastic art; into music and mathematics, physical and biologic science, psychology and social science and philosophy and theology; into our daily living; into our homes and business, and into our leisures and recreations, medicine has entered, not as an interloper but as an interpreter; not as a servant but as a teacher. From the moment of our first rising in the morning until the moment of our last conscious thought in the evening, medicine has in some way modified and sculptured our lives. Our diet and our dress, our work and our play, our thought and our prayer even, our rest and our travel have been influenced in the world in which we live today, whether it is amidst the thundering tanks of an attack or amidst the peace of Angelus-time in the countryside; whether it is amidst the stench of exploding bombs or among the sweetly floating perfumes of the summer flowers. In all of these, medicine has had its part in molding the daily régime that brings peace or turmoil, worry or joy, to the last and least of us.

It would not be in place to review here the recent findings of anatomy and physiology, of pharmacology and pathology, of clinical medicine and surgery and of the constantly increasing number of specialties to prove my point.

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Suffice it to say that from the moment of conception, and even before, until the grave we are with each breath through which our life is prolonged increasing the debt which we owe to the science and art which the first of the encyclopedists, Isador of Seville, pronounced to be the "synthesis of all the sciences and all the arts," because it concerned itself with that most valuable creature in God's creation, the human being.

Let me review, hurriedly as I must, the chief reasons as I see them, why it has been possible for the science and art of medicine to place mankind so deeply into its debt.

It has been first and foremost because medicine of all the sciences, with the possible exception of religion, has laid emphasis on the value of the human being; it has seen in each individual man the embodiment of its concentrated interest. History sees men come and go; it sees the passing of nations and of races; it becomes impersonal in the points of view which it develops concerning trends and tendencies in society. Economics, politics and government share the approach of history. These concern themselves with movements, with causes, with social change. Not so medicine. The physical sciences boast of their aloofness from personalities; they are not "tainted" as they would be if they viewed the matter by emotions and sentiments; they swagger in their claims to objectivity and would thereby disclaim all immediate concern for their significance to human life. Not so medicine. Even the representative and musical arts, I believe, are not concerned so much with the human being as a whole, with his dignity, his betterment, his happiness; they would rather emphasize his own power of self expression. Again, not so medicine. It has placed all of these other sciences and arts under contribution to increase the contentment and health and welfare of the individual human being. Let that individual be maimed by accident or laid low by disease or starved by privation, and medicine concentrates on his cure the combined resources of all of these sciences and arts; it labors for hours to prolong a life for minutes; it strains all its intellectual and moral wealth to bring the gift of a moment's freedom from pain to the sufferer. Think of the hours that are spent by our hospital personnel, by our physicians around the bed of a doomed patient to wrest from that failing protoplasm the last few moments of endurance.

Contrast with all of this the scenes which we are now witnessing. From our protected shores across an ocean from the waters of which there rises a sun that is stained anew each fighting day with the red blood of those whom medicine has attempted to make fit for human living and who today are made fit for an inhuman death, the individual whom medicine saves today becomes a pavement for the lumbering tank and the grinding heel. Each bomb and cartridge is a taunt to medicine. Each command to fight until death scoffs at the purpose of medicine. Each wound on the battlefield pronounces medicine a farce. What fools we men be to shoot a man to his knees in a fraction of a second and then spend years in keeping him alive as a cripple. And yet medicine accepts the mockery; it leads even the soldier to the frontline of defense, bids him God speed and in the first moment of need it is again at his side to wrap him tenderly in the arms of medical mercy and to nurse him back to a life, shall we say, of usefulness and happiness — at least to a life that is bearable.

What other interests and activities concern themselves with the individual as medicine does, except, to be sure, religion, which sustains him even in that horrible moment when death rides into his heart on the speedy bullet or on the crushing tank? All that our finest feelings abhor in the terrors of the moment medicine has long since abhorred and has proved its abhorence for by effective labor to save to a longer and a better and a happier life the individuals who today seem to count for naught, despite the preaching and the teaching of the science that alone of the natural sciences has kept the individual man on the pedestal of honor.

The second reason why medicine has placed mankind so deeply under its obligation is because medicine has sacrificed itself for the individual. The history of medicine is a history of a self-imposed slavery to the mastership of an ideal. Medicine's regard for the individual is not an empty ideal that stops at theory. Through the ages it has become a dynamic drive that has ceaselessly and restlessly driven on the physician to an ever more exacting sacrifice of self. I am not thinking only of those who gave their lives directly and immediately to discover the meaning of yellow fever or of typhoid or of diphtheria. I am thinking rather of those hidden workers of the laboratory who unsung and un-

named have added their share to our understanding of disease. I am thinking of the country practitioner of half a century ago who counted not the costs when there was question of saving the life of mother or father or child but plunged into the fastnesses of untrodden forests alone at night to bring comfort and solace to the failing pioneer. I am thinking of the physician and specialist of today, maligned and misunderstood though he be, who answers the call that summons him from the privacy of his comforts to assist the pauper or the prince of wealth alike in a moment of need.

He does this because he has felt in his practice the enthusiasm that grows from the contact of man with man; because he has tasted the stimulation of human relations in that confidence that has been reposed in him by an appreciative patient. He does it because he knows that he can do for others what they cannot do for themselves. He does it because he sees the opportunity to give to others in a few moments what it has taken him years to elaborate in his knowledge and his skill. He does it because he is the strength to the sick, the solace of the afflicted, the encourager of the dejected, the friend of the forlorn, the consoler of the afflicted. He does it because he sees a human being in need, and it is his life work to relieve that need.

And again, what a contrast with the world today when the infliction of pain and not the relief of pain, the execution of death and not the prevention of death, the creation of misery and not the destruction of misery threatens to become the preoccupation of the nations. We seek in vain words to describe the devilish barbarity, the savagery and malice that can be released from the human heart once it has smelt the warm sickening sweetness of the odor of human blood, of that same blood which has stimulated medicine to its most enobling self sacrifices, to the achievement of its highest conquests, to the attainment of its most elevated purposes.

What does it all mean, this paradox in life, that misery and suffering and poverty and disease can raise one human being on the wings of the angel of mercy to flights of selfforgetful heroism and can deprave another human being to the very depth of fiendish deviltry in the hatred of man for man. If there ever was a moment when man needed a reconciliation of the contrasts observed by his senses, the moment is now, and the man who is inspired with the inspirations of the purposes and pursuits of medicine will know that he holds in his hand the solution of the paradox. Medicine has pointed the way jointly with religion, as both have labored to save the individual from the world around him and, if necessary, even from himself.

And if a third reason must be given why medicine has placed mankind under such a debt to itself, it is because medicine has shown the way toward an appreciation of the values of life. Those values lie not in wealth or power, not in vast territories or vast hordes of gold, not in political honors or national domination; they lie in the safety, the security, the health and the contentment of the individual. They lie in the sanctities of family life, in the achievable ambitions of the individual man, in the invulnerability of his rights as a person and in the trustfulness and confidence of the relations of man to man. They lie in the dignity of manhood, the purity of womanhood and the sweetness of childhood; in the joy of living, the satisfactions of human associations, the impregnability of the home, the surety of a future and the safety of human satisfactions in old age. And all these, medicine has striven to safeguard. Witness the social legislation that has swept through the nations during the last decade or two. In each law that deals with the safety of mankind, medicine occupies a place of commanding, at times even, of dominating responsibility. Let life become more burdensome and painful, and old age security becomes a mockery; let disease stalk through the land, and employment laws become a hollow taunt; loosen the leash of hygienic living, and maternal welfare and child welfare and programs for crippled children become a mockery. All this social uplift, as we fondly call it, whether we admit or not, owes its significance to medicine, because medicine, in the last analysis, has made life worth living and has made a longer life a better life worth living.

In all of this thought I have linked in my argument medicine and religion. Rightly so would you say or wrongly so? From my point of view rightly so. The clamoring need of the nations today is for more help for body and mind; medicine supplies one, though not only one, and religion supplies the other, though not only the other, and this is possible because in their purpose, in their methodology, in their approach to

the individual, they are both as one. Both preach to us the sanctity and inviolability of the human being; both hold up to us for our admiration and our veneration, not in an empty manner but in a manner that motivates our action, the dignity of man. Only on the sickbed before the calm judgment of the diagnostician and only on the deathbed at the footsteps of an eternal judgment seat before which shortly a human soul will stand is it true that all men are equal. In all other contingencies and viscissitudes of life men cannot possibly be equal, and hence medicine and religion become the sole sound bases for the true democracy that emerges from nothing else than the equality of us men as individuals.

More than that, medicine and religion stand alone as defenders of the rights of the individual. Politics must count votes. It must have men in crowds. Government must count tax heads to raise the sources for national action. When it deteriorates, it reaches farther into the inviolabilities of life; it makes the individual subsurvient to the state instead of making the state subsurvient to the individual; it demands the service of the individual for the masses without realizing that the masses are made of individuals. Medicine and religion alone plead for the individual's dignity for his own sake; they expect nothing in return. The paltry sums which we call medical fees, which have so irritated the socializing devotees in medicine, are pittances in values no matter how large they may seem in dollars when compared to the values which medicine spills with lavish and unrestrained generosity into the lap of mankind. Medicine empties its huge cornucopia of blessings to shower its abundance on the heads of those who reverently but gratefully accept its benefits. And religion stands by to point to a strengthened and regenerated mankind, to the helpless babe and to the tottering elder, the pathway to a life beyond but a life in which the individual himself will be the individual achiever of an individual destiny.

The foundations of the beneficience of medicine have not escaped the erosions of time and of social change. There are those who clamor for change, those who clamor even for revolution and those again who clamor for nihilism in medicine. There are those who will not admit the priesthood of the physician, the wisdom of his experience, the comprehensiveness of his knowledge, the superiority of his training, the need of his long preparation. Ranging in their opposing interests from the amateur self diagnostician to the routinist who sees in medicine nothing more than a mechanical device for grinding out diagnostic and therapeutic procedures, these opponents of medicine clamor for lay interest in medical activities; these demand the elimination of the preferred dignity of a profession and see in medicine a trade. On the basis of their knowledge of a few unworthy to bear the title of physician, they attack medicine as a whole and deny the validity of the supreme ideals that dominate and unselfish science and art. They would attack the organizations into which medical men have banded themselves for protection, God knows not of themselves, but of the public, of the nations and of the world, against the selfish interests of some of their own members in the profession. These are the ones who see in disease only an economic problem that can be solved by larger governmental grants and by dipping more deeply into the treasure chest of an administration. These are the ones who deny the validity of serious investigations into the mysteries and problems of nature and who would equivalate the training of the scientist and the self discipline of the physician-artist to the quackery and charlatanism of palpably false medical theory and a demonstrably false concept of human life. To be sure, this catalogue of those who are chipping away at the foundation stones of medicine is not exhausted, but it is enough to indicate the groups of those whom I mean. They fail to know that in the temple of medicine the individual human being is enshrined in his niche and that the priests of medicine pay homage and service to that individual. And perhaps even if they knew that such is the case, they would not care. In many instances, surely, the chiseling at the motar that holds the stones in the foundation is done because a philosophy of values that exalts government to be the master of the people has dictated an attack on the sustaining ground — work of a civilization that is based on the dignity not of mankind alone but of each member of mankind. The threats to medicine have all too often been threats to government as we understand it, government in a democracy.

You are the ones who stand side by side and shoulder to shoulder to those who carry in their hands the destinies of man. You are the inspirers of those who save human life. Yours is the joy and privilege of sustaining them who sustain others; who share their dignity, their obligations, their achievements, just as you share their anxieties, their worries and their labors. Like the vestal virgins of Rome, you keep alive the fires of unselfishness, the fervor of devotion, the enthusiasm of ideals. Your dignity lies in safeguarding the hopes and ambitions of the physician, who in turn safeguards the sanctity of the individual.

THE CLINICAL APPLICATION OF VITAMIN K

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To deal intelligently with the clinical application of vitamin K one first must be familiar with the four fundamental factors that are necessary to promote normal metabolism if a deficiency of prothrombin is to be avoided. These factors include: 1. a normal diet that contains the vitamin; 2. the presence of bile of normal composition in the intestinal tract; 3. normal absorption from the intestine and 4. a normally functioning liver.

A primary deficiency of vitamin K due to inadequate diet is difficult to produce experimentally both in animals and in man. This type of deficiency appears to be rare in man in spite of the fact that many diets undoubtedly are deficient in vitamin K. This fact suggests that perhaps bacterial activity in the intestinal tract produces enough vitamin K to meet minimal requirements. However, Kark and Lozner have described cases of minor degrees of prothrombin deficiency which apparently resulted from an inadequate diet alone. We have recently observed a patient who subsisted for two years on a virtually fat-free diet in which leafy vegetables and other known sources of vitamin K were practically excluded. This patient had only a minor degree of hypoprothrombinemia of about the same order of magnitude as in the group reported by Kark and Lozner. Likewise, patients with nervous vomiting and anorexia nervosa do not have any particularly striking deficiency of prothrombin in the plasma. Although a previously inadequate diet, diarrhea or continued vomiting may lay the groundwork for this state of deficiency, some other development such as an abdominal operation appears necessary to precipitate a deficiency of prothrombin.

The prothrombin deficiency that results from failure of absorption of vitamin K constitutes two distinct types of clinical cases. The first group consists of cases in which bile is excluded from the gastro-intestinal tract by an external fistula or by obstruction of the common duct from any cause and in these instances the fat-soluble vitamin K is not absorbed because of the lack of bile or a poor quality of excreted bile salts. This story of prothrombin deficiency resulting from obstructive jaundice or from biliary fistula has already been told today by Dr. McNealy and needs no repetition here. The second group of cases that would appear under this division are those in which there is inadequate absorptive intestinal surface. This group includes sprue, intestinal polyposis, regional ileitis, intestinal obstruction, gastrocolic fistula, pyloric obstruction, ulcerative colitis and so forth and in all of these hypoprothrombinemia and a hemorrhagic diathesis have been demonstrated. In these cases the combination of a deficient diet, loss of essential substances by vomiting and diarrhea, and an abnormal state of the mucosal surface of the gastro-intestinal canal are sufficient to produce serious depletion of prothrombin. In these cases, as in cases of jaundice, the deficiency of prothrombin does not often reach any serious proportion until after some surgical procedure designed to correct a primary condition has been undertaken.

It has been well-established by the experimental work of Smith and his associates and Warner that the liver is the organ primarily concerned in the synthesis or metabolism of prothrombin. Smith and his group have demonstrated that hepatotoxin results in a fall in prothrombin in the circulating blood and Warner has shown that partial hepatectomy may cause an initial fall of the prothrombin to about a 20 per cent level and that this level gradually rises as the hepatic parenchyma regenerates. In fact, it has been shown by Lord that even local trauma to the

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liver, such as might occur in the course of operations on the biliary tract, results experimentally in a fall in the concentration of prothrombin in the circulating blood. All of these experimental instances point to the fact that the liver is extremely important in the metabolism of prothrombin and likewise in the metabolism of vitamin K. It must be emphasized that hypoprothrombinemia resulting from hepatic injury does not represent a pure vitamin K deficiency but does represent a primary deficiency in the formation of prothrombin. Therefore, patients with severe hepatic damage may exhibit a deficiency of prothrombin which is due solely to hepatic injury and is not concerned with any deficiency of vitamin K. In most instances, however, there is a combination of both of these factors which results in hypoprothrombinemia. It has been our experience that in any instance in which there is extremely severe hepatic damage a deficiency of prothrombin does not respond to the administration of concentrates of vitamin K or even to more potent synthetic compounds which possess antihemorrhagic activity. In many cases in which an elevated prothrombin time will not return to normal following administration of the usual corrective dose of vitamin K, it is well to consider that this constitutes a dangerous risk for any operative procedure. Indirectly, this failure to respond to vitamin K is a measure of hepatic function.

EFFECTS OF TREATMENT OF PROTHROMBIN DEFICIENCY WITH VITAMIN K

It has been comparatively well established by several groups of investigators that vitamin K is of no value except in those conditions in which a deficiency of prothrombin exists. The vitamin has been of no value in control of uterine bleeding, hemophilia, essential thrombocytopenic purpura, essential hematuria, familial bleeding tendency and aplastic anemia. It is the opinion of most investigators in this field that to use vitamin K in such cases is a waste of both time and money. In those instances in which a deficiency of prothrombin actually exists, vitamin K has been notably successful. Dr. Quick already has spoken about its wide and successful use in the treatment of hemorrhagic diseases of the newborn and Dr. McNealy has presented its great value in the preoperative and postoperative care of patients with obstructive jaundice. In addition to these uses, vitamin K has also been of great value in the preoperative and postoperative care of patients with certain intestinal disorders.[5] Although prothrombin deficiency referable to difficulties in intestinal absorption is not often encountered, it does appear in a distinct group of cases and warrants consideration.

When hemorrhages occur in cases of extensive disease of the intestine either before or after surgical treatment, a deficiency of prothrombin should be excluded before treatment for other types of bleeding is instituted. It is interesting that response either to concentrates of vitamin K or to the synthetic compounds that have vitamin K activity is rapid and spectacular in these cases. It should be emphasized that there is apparently little or no absorption of the vitamin from either the stomach or the lower part of the colon and that direct access of the vitamin and bile salts to the intestinal lumen is necessary. In cases of extensive intestinal disease, therefore, parenteral preparations are of much value. The dosage and methods of administration are the same as those recommended for the patients with obstructive jaundice and need not be repeated herein.

RECENT DEVELOPMENTS IN PHYSIOLOGY AND CHEMISTRY OF VITAMIN K

In 1939, it was reported that vitamin K had a quinoid structure and later it was reported that a synthetic substance, called phthiocol, proved to have marked antihemorrhagic activity.[3] During the past few months, vitamins K_1 and K_2 have been isolated, vitamin K_1 has been synthesized and several other derivatives of naphthoquinone have been proved to possess antihemorrhagic activity.[1, 2, 6] The availability of synthetic compounds that can be administered by the oral or intravenous routes marks a great therapeutic advance in the treatment of the hemorrhagic diathesis associated with a deficiency of prothrombin. These substances are not yet on the market but it is hoped that they will be within the next few months. They are valuable because they can be given in small doses orally or intravenously and the chances are that they will be much cheaper than the vitamin K concentrates now available.

Several investigators have already reported that phthiocol (2-methyl-3-hydroxy-1,4-naphthoquinone), 1,4-dehydroxy-2-methyl-3-naphthalde-

hyde, 2-methyl-1,4-naphthoquinone[4, 5, 9] and other compounds are effective parenterally in both animals and human beings who exhibit a deficiency of prothrombin in the blood. We have found that 2-methyl-1,4-naphthoquinone and vitamin K_5 (4-amino-2-methyl naphthol hydrochloride) are equally effective when given parenterally to human beings. We have also attempted to determine the probable speed of action of these various synthetic materials when given intravenously to man and have found that they begin to act within an hour or less and that there is a definite drop in the elevated quick prothrombin clotting time within two or three hours after the intravenous administration of doses as small as 1 to 3 mg. In fact, it has been noted that excessive bleeding in the course of an operation on a patient who has hypoprothrombinemia decreases markedly following the intravenous administration of these compounds while the patient was still on the operating table. Vitamin K_5 (4-amino-2-methyl naphthol hydrochloride) has been administered to more than forty-five patients and toxic effects have not been noted in any instance. We are indebted to Parke, Davis and Company for furnishing us with a supply of this material. An equally large number of patients have received 2-methyl-1,4-naphthoquinone without any untoward reactions being noted. Abbott Laboratories were kind enough to furnish us with a supply of this material.

Even with these new synthetic compounds we still encounter instances in which the elevated prothrombin clotting time does not return to normal following the administration of these compounds. These cases constitute real failures and in all instances have been those in which there is present a severe degree of hepatic damage. These so-called failures constitute a definite group and should be expected if one is treating a large number of patients who have hepatic diseases.

Summary: To administer vitamin K intelligently the physician must follow closely the value for prothrombin in the circulating blood and good treatment depends on the physician's ability to recognize and to prevent hemorrhage which may result from a deficiency of prothrombin. To obtain this knowledge the physician must be well acquainted with the physiologic principles that underlie production of hypoprothrombinemia. Without this knowledge even the use of the most active compounds will fail us in our effort to relegate the fatal hemorrhages that are caused by a deficiency of prothrombin to the medical and surgical practice of the past.

REFERENCES

1. Almquist, H. J. and Klose, A. A.: Synthetic and natural antihemorrhage compounds. J. Am. Chem. Soc. 61: 2557-2558, 1939.

2. Binckley, S. B., Cheney, L. C., Holcomb, W. F., McKee, R. W., Thayer, S. A. MacCorquodale, D. W. and Doisy, E. A.: The constitution and synthesis of vitamin K_1. J. Am. Chem. Soc. 61: 2558-2559, 1939.

3. Butt, H. R., Snell, A. M. and Osterberg, A. E.: Phthiocol: its therapeutic effect in the treatment of hypoprothrombinemia associated with jaundice; a preliminary report. Proc. Staff Meet., Mayo Clin. 15: 497-502, 1939.

4. Butt, H. R., Snell, A. M., Osterberg, A. E. and Bollman, J. L.: Treatment of hypoprothrombinemia; use of various synthetic compounds exhibiting antihemorrhagic activity (vitamin K_1 activity). Proc. Staff Meet., Mayo Clin. 15: 69-73, 1940.

5. Clark, R. L., Jr., Dixon, C. F., Butt, H. R. and Snell, A. M.: Deficiency of prothrombin associated with various intestinal disorders; its treatment with the antihemorrhagic vitamin (vitamin K). Proc. Staff Meet., Mayo Clin. 14: 407-416, 1939.

6. Fieser, L. F., Campbell, W. P., Fry, E. M. and Gates, M. D., Jr.: Synthetic approach to Vitamin K_1. J. Am. Chem. Soc. 61: 2559, 1939.

7. Kark, Robert and Lozner, E. L.: Nutritional deficiency of vitamin K in man; a study of four non-jaundiced patients with dietary deficiency. Lancet. 2: 1162-1163, 1939.

8. Lord, J. W., Jr.: The effect of trauma to the liver on the plasma prothrombin; experimental study. Surgery. 6: 869-898, 1939.

9. Macfie, J. M., Bacharach, A. L. and Chance, M. R. A.: The vitamin K activity of 2-methyl-1:4-naphthoquinone and its clinical use in obstructive jaundice. Brit. M. J. 2: 1220-1223, 1939.

10. Smith, H. P., Warner, E. D. and Brinkhous, K. M.: Prothrombin deficiency and the bleeding tendency in liver injury (chloroform intoxication). J. Exper. Med. 66: 801-811, 1937.

11. Warner, E. D.,: Plasma prothrombin; effect of partial hepatectomy. J. Exper. Med. 68: 831-835, 1938.

OTOLARYNGOLOGY AND THE WEATHER

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"Everybody talks about the weather, but nobody does anything about it." I am quite certain that many of the members of this assembly will recall the statement widely attributed to Mark Twain. Actually, however, Mark Twain's comment is not strictly true — for the importance of the effect of weather on the human being was recognized and described in detail as long as 2500 years ago. It was Hippocrates, the world's

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first meteorologist, who insisted that all disease was due basically to interference with processes which today would be called "oxidation" and that in the mechanism involved we were dealing with changes in the caliber of the blood vessels. This was excellent clinical observation 2500 years ago. It is as true today as it was then.

In this country and during this century Huntington and Mills have done much to create an understanding of the relation of climate to health, but it is Petersen[1] in particular who has described the day-by-day weather influences on the normal person and on the patient. A good deal of the gradual return of interest in the subject is due primarily to the circulation of Petersen's epochal work, "The Patient and the Weather." In the field of contemporary otolaryngological studies the association of weather and acute infections of the upper respiratory tract has been studied by a number of investigators. Others have observed distinct relationships between corresponding weather conditions and the distribution of colds, sinusitis, tonsillitis, migraine, otitis media and mastoiditis.

Since the weather and the season function together as perhaps the most important environmental factor from the time we are conceived to the time we die, the fact that they can now be measured with considerable accuracy constitutes a distinct advantage. It is possible for any number of environmental factors, such as emotion, diet, infection, intoxication and fatigue to influence a person, but it is extremely difficult to evaluate them. The weather, however, can be measured. Thus, daily temperature changes are measurable, as likewise are barometric pressure, daily average wind velocity, daily sunshine and daily precipitation. The weather is apt to produce physiologic changes in any region of the human body that is inadequate. This will find expression in unusual symptomatology, in change in function, or in actual pathology in the various organs of the body — factors all that are measurable. Consequently, today we are able to measure both the stimulus, i.e. the weather, and its effect upon the human being, i.e. the clinical, biochemical and vasomotor changes that are induced in the human.

There are many inplications for everyday medicine. We are, for example, constantly carrying a variety of bacterial organisms on our mucous membranes that in most instances do not penetrate. If, however, the physiological function of the mucous membranes is constantly pendulating, we can readily see that at certain times bacterial penetration may be more readily achieved. Infection can then result. The common "cold" is a typical example. Recent investigations by Sargent[2] concerning the common cold in several hundred normal young men observed under normal conditions of activity and subject to the same weather conditions make evident that when a person is seen daily the initiation of a "cold" or "sore throat" is always seen to be preceded by an episode involving a fall in atmospheric temperature.

The mechanisms that underlie the breakdown in resistance to infection that we observe in the common cold are quite similar to those that we find operating in the acute tonsillitis and in the streptococcus sore throat. Fabricant[3] has analyzed a series of cases of acute tonsillitis in children ranging in age from one year to ten years, involving both sexes, each child sufficiently ill to warrant hospitalization in a pediatric hospital during 1938. Although scores of patients with acute tonsillitis were seen, only 19 were regarded as sufficiently ill to require hospitalization. The precipitation of acute tonsillitis in these children took place most often in the wake of a "cold front," i.e. a time when the air temperature became colder, the barometric pressure increased, and there was lessened humidity. At this time there was a period of relative anoxia in the mucous membranes of the nose and throat, and the passage of surface bacteria was facilitated so that the objective evidence of the "sore throat" became discernible within a few hours to one or more days. A further study[4] regarding the onset of acute otitis media and mastoiditis revealed that the precipitation of these diseases also occurred when there was a fall in the atmospheric temperature and a subsequent change in the functional status of the mucous membranes.

It would lead too far afield to discuss all of the factors involved in the production of headache and migraine. The precipitating causes will be found to vary and will involve anything that will necessitate an autonomic readjustment of the organism. It follows that in the autonomically unstable person, very minor weather changes may precipitate a headache. In the relatively

stable person a much greater impulse is required. Inasmuch as the environmental element that is most subject to fluctuation is the atmosphere in which we live, major alterations of barometric pressure, temperature and humidity will precipitate a majority of headaches. The ultimate mechanism is in all instances alike. The headache results from vascular spasms in the cerebral vessels. This may be pronounced on one side of the head because of underlying differences in the oxidation in the two sides of the brain. It occurs with the vascular spasm and anoxemia results from the defective blood supply to the tissues.

Without going into scientific meteorology we can simplify the subject by stressing the significance of the fact that as human beings we must adjust ourselves periodically to two wholly different types of atmosphere or air masses. We speak of these as polar air masses (cold fronts) or tropical air masses (warm fronts). The polar air mass (cold front) consists of dry, heavy, clear, cold air. It brings with it not only a lowering of temperature but lessened humidity and an increase in barometric pressure. On the other hand, increasing temperature is characterized not only by a warmer mass (warm front) but by greater moisture content and lower barometric pressure.

It is generally acknowledged that chilling of the body surfaces causes constriction of the blood vessels of the skin and periphery and that this is followed by a constriction of the blood vessels of the nasal mucous membrane. A prolonged ischemia of the nasal mucosa naturally reduces the local resistance and favors infection. Likewise, local chilling of the body surfaces is often induced by inclement weather. In the wake of a cold front there is a change in the functional status of the mucous membrane of the nose and throat. The precipitation of disease occurs at this time, although a few hours to one or more days may elapse before the clinical symptoms make their presence felt. One cold front may be passed without instituting harm, but it is the repeated or superimposed cold front that often results in further damage. A second insult, one that strikes the individual before adequate recovery has been possible, may contribute to further biologic instability. The infall of cold air is pathogenetic, either directly because of the vascular spasm induced by the weather, or indirectly because of the changes that follow the vascular spasm.

In storm track regions such as that of the Great Lakes where there is considerable environmental variability there will be considerable variability of the vessels of the mucous membranes. Consequently, there will be rich opportunity for penetration of the flora of the upper respiratory tract. In addition to this, those of us who live in such regions will not only be stimulated to a greater degree but also fatigued to a greater extent at certain times of the year, and with this there will be unusual lowering of our resistance so that we are more prone to sore throats, colds, sinusitis, otitis media, mastoiditis and upper respiratory infections.

In a general way every period of passing cold weather is associated with an increase in blood pressure. This is due to the fact that the peripheral vascular beds tend to close. During this time there is a relative anoxia of the tissues in large areas of the body. Such a reaction may subjectively be experienced as a period of "stimulation" by the individual because, with increasing blood pressure, the individual is apt to feel buoyant and energetic. It may occur in midsummer with the skin vessels normally dilated and the skin covered with sweat, when a seemingly minor change in the speed of surface evaporation, or an apparently minor change in the atomospheric temperature, may cause sudden and widespread contraction of the peripheral vascular bed. It may occur in the tropics where the chill of the "night air" may initiate a similar effect. It may follow in the winter when a seemingly minor weather change may bring about a mucous membrane alteration of sufficient magnitude to permit the ready passage of organisms.

In the human being we therefore deal with a continuous rhythm of increasing and decreasing resistance from hour to hour, from day to day, and from season to season, and environmental alterations (cooling, for instance) that can be useful to one individual by increasing tone, will in the inadequate individual lessen resistance because of increasing fatigue. As long as oxygen adequacy is maintained, resistance is good. The moment oxygen inadequacy occurs, resistance is impaired. This fundamental truth which Hippocrates promulgated 25 centuries ago is today being accepted by many investigators who sus-

pect the existence of such effects.

The effect of cold, however, is only one of the factors that precipitate change. Thus, the lack of sunshine, the change in barometric pressure, the change in humidity, and increased wind velocity, to mention but a few of the weather factors involved, are all of importance. While air-conditioning engineers are just beginning to learn how to control the temperature of a home or a hospital, it is quite obvious that an individual's response to an environmental change involving, let us say, barometric pressure and humidity, offers an exceedingly complex problem in control.

In our region of the world no climatic situation is ever repeated. Not only does each day differ, but every season and every year differs to some extent in its demand on the population. The vasomotor effects occur simultaneously in the population at large which is subjected to the passage of the air mass. But it should be remembered that the vasomotor reactions that are elicited in groups of people will differ in amplitude, and that at times there may be an accentuation or delay in the reaction of the organism to the environmental change in different kinds of people.

The vasomotor and biochemical changes induced in the population when a cold front or mass of polar air passes over this group have been described thoroughly by Petersen. His own approach to this entire study has been made by means of day-by-day chemical determinations of the blood and urine, as well as clinical and physiological observations on normal individuals and on individuals sick from a number of different diseases. When the mass of cold air passes over a population group there is, of course, evidence of vascular spasm. At first the capillaries are less permeable and there is an increase in blood pressure. The tissues become less hydrated, while the blood becomes relatively more alkaline (pH increased, carbon dioxide content decreased). Such a phase might be termed a sympathicotonia or a pressor crisis and finds its reflection particularly in the peripheral tissues, including the mucous membranes of the nose and throat.

After this reaction takes place, the reversal sets in. Gradually the vascular spasm is dissipated. The blood vessels begin to dilate so as to accommodate the increased demand of the organism for greater oxygen consumption. The capillary walls become more permeable and fluids tend to leave the vascular bed. The blood pressure falls, the membranes become more permeable, and the tissues become relatively more acid and hydrated. At such a time the individual is apt to experience the feeling of fatigue and during this period bacterial penetration is more apt to occur. Later on, the bacteria having penetrated into the mucous membranes, disease is initiated by local reactivity of the tissues, dissemination, or localization in the body after dissemination. Localization in the tissues will be favored immediately by the changes induced by vascular spasm.

Thus, the shift from the cold front under which a population exists to the warm front diametrically opposite in most of its qualities is definitely associated with biochemical and vasomotor changes taking place in that population. Changing environments produce changing energy demands on human beings who are no longer adequate. Under the continuous pendulation of temperature, humidity, barometric pressure, etc., the population reacts by constantly swinging from a phase in which vascular spasm is enhanced to one in which vascular dilatation is emphasized, and vice versa. Therefore, since such fluctuations form a constant biologic phenomenon, and since the changing air mass is measurable within a reasonable degree of accuracy it is quite possible to measure all of the factors involved — both the weather and the changes taking place in the human being — in producing the coup that pushes the organic mechanism over the edge of normality.

Now, what does all of this mean for the patient in general, and for the otolaryngological patient in particular? We know that biological rest is one of the greatest factors in the recovery of patients. That in planning the modification of environmental conditions for our patients we must consider the possibilities of contributing to their comfort by introducing a more equable situation so that patients get greater biological rest than they would if they were exposed to the continuous swing of temperature, humidity and barometric pressure. As soon as our airconditioning engineers can control such factors as those I have mentioned and as soon as physicians every-

where take cognizance of the clinical, biochemical and vasomotor changes that are produced in the human being by the weather, we who practice medicine shall have available a great therapeutic tool for a wide variety of acute and chronic diseases.

BIBLIOGRAPHY

1. Petersen, Wm. F.: The Patient and the Weather, Vols. I-V, Ann Arbor, 1934-1938, Edwards Bros.
2. Sargent, F.: Studies in the Meteorology of Upper Respiratory Infections, Bull. Am. Meteorol. Soc. 19: 385, 1938.
3. Fabricant, N. D.: The Climatic Factor in Precipitating Acute Tonsilitis in Children, Jour. Pediatrics, 15: 607, 1939.
4. Fabricant, N. D.: The Climatic Factor in Mastoiditis, Arch. Otolaryngol., 30: 549, 1939.

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DISCUSSION

Dr. Max Berg, Chicago: I wish to emphasize a few general and fundamental concepts on the relationship between the atmospheric conditions and physiological conditions or disease processes. The studies may be classified ito two large groups: First, those associated with the weather, that is those changes occurring over short periods of time; and, second, those associated with climate, and by climate is meant the average of conditions over many years.

To illustrate a few of the physiological changes associated with the weather: With changes in the weather are associated vascular constriction followed by dilatation, changes in blood sugar, B.M.R. and capillary permeability. These are shown on normal individuals by a series of slides. The weather is certainly not the only factor which influences an individual's responses; it is only one of many factors.

To illustrate the association of climate and disease: The distribution of deaths from angina pectoris (U. S. mortality statistics 1920-1930) follows in a striking way the distribution of the storm tracks with more deaths occurring in the regions where presumably greater vascular instability associated with greater frequency of storms is found. (Slides)

THE TREATMENT OF ACUTE GLOMERULONEPHRITIS

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Acute glomerulonephritis is a self-limited disease. The chief concern of the physician is to maintain water balance, provide adequate nutrition, and obtain skillful nursing care. Careful clinical observation is needed during the initial phases of the disease, so that complications may be readily detected and effective therapeutic measures instituted.

The well known changes of the glomerular tuft and Bowman's capsule have long been studied as the prototype of acute inflammation. A majority of the filtering units of the kidneys are clogged by these products of inflammation and their effectiveness reduced to almost nothing. At this stage of the disease, very little urine is manufactured. What little that is passed contains a great deal of albumin, casts, red blood cells and nitrogenous waste products. Yet, this scant amount of urine is not sufficient to rid the body of its waste products; consequently, during the first three to five days of an acute hemorrhagic nephritis, these substances accumulate in the blood stream. Important changes take place in the glomeruli within the next few days. Capillary buds spring from the endothelial cells and soon form a fully developed glomerular unit.

The treatment of acute glomerulonephritis is largely nursing and dietetic. Complete bed rest is imperative. As soon as the disease is diagnosed or suspected, the patient should be put to bed. Every effort must be made to prevent the patient from chilling. A warm well-ventilated room and warm or flannel bed clothes are advisable. Usually the patient should be kept in bed until hematuria, proteinuria, or casts disappear from the urine. If the proteinuria persists after two months, it has been our practice to allow the patient to gradually resume some of his former activity in the third month. Fewer cases of chronic nephritis result when early complete bed rest is obtained.

Dietary treatment has been concerned chiefly with assisting the natural reparative processes. Volhard and Fahr[1] concluded rest was most essential, so they advocated a thirst-hunger regime in 1914. All food and fluid was withheld for a period of three to five days in an effort to completely rest the kidneys. Very little urine was formed and passed as the result of this management. Fewer complications were seen after this treatment than followed the older methods of forcing large quantities of fluid. Volhard's method consistently gave good results and many endorsed it.[2, 3] It soon became evident that there were two serious objections to the procedure. As the patient daily lost water through his breath as vapor, through his skin and through the

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bowels, a hunger-thirst plan made the patient draw on his body store of water. Thus, the perils of dehydration were added to those of the disease. Second, starvation plus the fever often produced mild acidosis.

Volhard[4] then modified his plan. The bowels were first emptied by a saline laxative. In children or those adults weakened by previous disease, he allowed either a little fresh fruit, a few crackers, sugar water, one to two cups of weak tea, or hypertonic glucose intravenously for the first few days. All other patients were on a strict hunger-thirst program until diuresis set in. Most authors have modified it slightly. Fishberg[5] allows a half glass of lemonade thrice daily and a half an orange twice daily for the first three days. Stone[6] suggests the plan be made more liberal by giving fresh fruit juice, cracked ice and graham crackers, and Mosenthal[7] gives a pint of bland fluid, e. g., orangeade, lemonade or weak tea sweetened with sugar or lactose together with three easily digested portions of food as oranges, grapefruit, or baked apples. In children Lyttle[8] recommends that adequate fluid be given and does not hesitate to use hypertonic glucose intravenously until diuresis sets in.

A method of treatment that provides sufficient fluid to supply the losses through vapor, the skin and bowels and also furnishes enough caloric intake to guard against starvation acidosis would be ideal. We have found the Karrell diet satisfies these conditions.[9] Two hundred and fifty cc. of milk are given every four hours during the waking day, i.e., 8:00 A. M., Noon, 4:00 P. M. and 8:00 P. M. for the first four to six days. It has the advantage of furnishing 1,000 cc. of fluid and 700 calories daily. While this is considerably below the patient's basal requirements, it is much more than given by the fruit juice diets. Objection will be raised that the milk diet contains 300 Gm. of protein and 1.8 Gm. of sodium chloride; but we have never observed any ill effects from them. In fact, there is no proof that protein or salt are harmful in acute nephritis. The simplicity and easy availability of the Karrell diet far overcome any theoretical objections.

A diet largely of carbohydrates was given in the past on the theory that they were burned to CO2 and water and would not involve the kidneys. These concepts are really carry-overs from the older theory of urinary formation as a secretory process. Actually such diets mean that the kidneys must filter and reabsorb additional amounts of glucose and water, so the kidneys are really not spared. Sodium chloride, glucose and water are constantly being filtered through the glomeruli. In these starvation programs the work of the kidneys is increased as these substances are reabsorbed with greater avidity. Food is continuously broken down, and unless small amounts of glucose are given, the dangers of acidosis are present. As glucose will furnish ready calories and aid in the oxidation of fat, body proteins are not burned to as great an extent. Thus glucose is really a protein sparer. Lichtwitz[2] stresses the importance of frequently testing the urine for acetone bodies while the patient is on the hunger-thirst management. We have found the Karrell diet obviated this necessity.

Proteins influence the rate of urea and nitrogen excretion. Addis[10] has shown that acute hemorrhagic nephritis was neither influenced by a high or low protein diet. Keutmann and McCann[11] very carefully studied four patients with glomerulonephritis. They were alternately given low and high protein diets (30-200 Gm.) and showed no change in hematuria or urea clearance; and they concluded high protein diets do not impede the recovery of a patient with glomerular nephritis. In similar experiments Naeraa[12] found no changes in the Addis counts[13] of patients with acute Bright's disease after 125 Gm. protein diets.

Acute glomerulonephritis is a self-limited disease and diuresis usually spontaneously begins after three to seven days. As soon as the patient begins to pass large quantities of urine a dietary adjustment must be made. The Karrell diet is increased to include: fruit juices, fruits either cooked or fresh, cooked vegetables except rice, corn, green peas or lima beans; oatmeal, tapioca or arrowroot puddings, baked potato, butter, clear jelly, sugar, honey and cream. An attempt is made to increase the caloric intake so that it will meet the basal requirements of the patient. Fluid intake is governed by urinary output. If laxatives are needed, mineral oil or milk of magnesia are advisable, but mercurials, as calomel, are contraindicated because of their nephrotoxic action.

Diuretics are rarely needed. If the patient fails to have a spontaneous diuresis after five days the "Wasserstoss" or dilution test of Vol-

hard might be tried. It consists in giving 1,500 cc. of weak tea within ½ to ¾ hours, early in the morning. Volhard has reported surprising diuresis from this procedure with a decrease of edema and a lowering of blood pressure. He stresses the importance of giving the fluid within a short period of time and has found the same amount of fluid given in divided doses not nearly as effective. If necessary, the procedure may be repeated after two to three days and theophylline added. Volhard believed the water opened up spastic arteriols and called it a "water blow or stroke." We have never used it and the treatment has not been generally accepted in America.[5, 6, 7] It has been our contention that adequate fluid early in the disease will frequently forestall the necessity of this regime.

Within the third to the sixth week there is a decrease of blood NPN, urea N, and creatinine so that a third adjustment of diet is needed. At that stage the patient can clear his blood of retained nitrogen wastes, so that additional protein may be added. An intake of at least 60 Gm. of protein daily in adults is necessary to replace the daily wear and tear of body tissue and replace the somewhat depleted protein deposits. Meat, fish, fowl, eggs, milk and bread are the main sources of supply. Fluid intake is generally held to 1,200-1,500 cc. daily; the salt of the diet should be restricted to 5 Gm. daily, and all spices and condiments prohibited.

The effects of different diets on the production of acute glomerular nephritis after scarlet fever have been studied. A number of years ago Pospischill and Weiss[14] divided the children with scarlet fever into two groups. In one pavilion they were fed a milk and vegetarian diet, in the other they were given large quantities of meat and broth. There were 116 cases of nephritis among 1,186 children who had been given a milk diet, or 9.78 per cent and 118 cases of nephritis among 1,186 children that received the meat diet, or 9.95 per cent. From this it was concluded that a meat diet was no more injurious than a milk diet. Also it was pointed out that the children who received the milk-vegetable diet were pale and lethargic, whereas those on the meat rations were energetic and robust. Jochmann,[15] in studying 1,000 children with scarlet fever, found meat did not adversely affect them.

A month and a half or so after the onset of acute glomerulonephritis the patient enters a precarious state. Every patient with an acute nephritis is a potential candidate for chronic nephritis, so every possible effort should be made to promote complete healing as early as practicable. Patients with latent, mild, subacute, subchronic, or transitional nephritis are not well understood;[16] consequently, they receive vague or indifferent treatment. Altogether too much emphasis has been placed on classification; and if these patients were considered as unhealed nephritis, as Leiter[17] has suggested, they would be given better treatment. At this stage dietary management and complete rest are of prime importance in the facilitation of healing. Holten[18] of Denmark has reported the largest percentage of healed cases using a diet of: 200 cc. of oatmeal, 400 cc. of half milk and half cream, a plate of rice, fruit compote, two slices of bread with unsalted butter, and six ounces of lemonade sweetened with sugar. This gives the patient 25 Gm. of protein, 55 Gm. of fat and 108 Gm. of carbohydrate with a caloric value of 1,100; in addition, it contains 700 cc. of fluid and contains vitamins A, B, C, and calcium. When it is given longer than three weeks, vitamins D and G are added. In a series of fifty-two patients suffering from acute glomerular nephritis, forty-one were eventually healed, of whom all but six cleared up within three months on this treatment. We have found it better to adjust the treatment to the patient's needs. Since considerable protein is lost in the acute inflammatory process, a larger protein diet, 40-80 Gms. is given.[19, 20] If there is renal insufficiency, this amount may have to be restricted. With the onset of edema, water and salt are greatly restricted, but sufficient protein is given to overcome that lost in the urine.

Acute glomerulonephritis is a self-limited disease that tends toward spontaneous recovery, but that has two complications which are often fatal. They are cardiac failure and acute pseudouremia.

Recently, there has been renewed interest in the changes of the cardiovascular system following an attack of acute nephritis. Volhard and Fahr[1] stressed the frequency of dyspnea, orthopnea, and pulmonary edema in the course of the disease; and they pointed out that in the adult the pulse rate in acute nephritis was sixty to seventy beats per minute. A rate of eighty or

more was taken as a sign of cardiac embarrassment. "Every patient with acute hemorrhagic nephritis should be looked on as one in whom acute heart failure may develop." In contrast to this is the statement by Christian[21] that, "The heart is unchanged by acute nephritis except in a rare case." Most acute infections involve the heart by a concomitant acute myocarditis. Acute glomerulonephritis presents an unique situation. There are two factors active, the acute inflammatory process and the hypertension. Since hypertension can be easily measured and recorded it presents no problem. Any information relative to myocardial changes would be most welcome. The electrocardiograph is a necessary aid.

Cardiac failure in acute glomerulonephritis is often fatal. Levy[22] studied ten patients and reported one death. Langendorff and Pick[23] also had one fatal case in a series of twelve patients; while Rubin and Rappaport[24] found cardiac involvement in fourteen out of fifty-four children, with two deaths. There were eight cases of congestive failure in the twenty-four patients observed by Master, Jaffe and Dock.[25] They described a typical EKG pattern and found significant abnormalities in nineteen of their patients. However, they were unable to correlate the presence of congestive failure or hypertension with these electrocardiographic changes. Complete serial electrocardiographic studies of twelve patients were done by Langendorff and Pick. They stressed the importance of high pointed T waves in lead III and called attention to the similarity of other changes to anterior infraction. However, they did not observe precordial lead changes nor a negative T4.

In the acute stage of glomerulonephritis the danger to the heart is most important. A pulse rate of eighty or more, dyspnea, increased venous pressure, enlargement of the liver, or electrocardiographic changes are evidence of an impending cardiac failure. Digitalis must be given as soon as these signs appear.

Sixty-one patients entering Research and Educational Hospital with acute glomerulonephritis were studied. There were eleven deaths in the group, of whom six died of cardiac deaths. Two of the latter had previous valvular defects, one an aortic regurgitation and the other a high grade mitral stenosis. Subacute bacterial endocarditis caused two additional deaths, one died of a hemorrhagic pericarditis, and one died of an acute myocarditis. Twenty-one of the patients had tachyeardia, dyspnea or enlargement of the liver so that digitalis was given. These figures are considerably in excess of those generally reported, due to the fact that in many instances only the more severely ill patients were admitted to the hospital.

Acute pseudouremia is the other important complication of acute glomerulonephritis. It is characterized by headache, apathy, vomiting, convulsions, amaurosis and coma. In the past it was miscalled uremia, but it is not related to the absolute retention of nitrogenous waste products in the blood stream; for it frequently occurs when the NPN is 40-60, the urea N 30-40, and the creatine 2.0-3.0 mgm. per 100 cc. The condition is associated with edema of the brain and increased intracranial tension.

Usually it follows transient rises of blood pressure and it disappears with a fall in blood pressure. The rapidity of the rise in blood pressure is of greater significance than the absolute height, although acute pseudouremia must be suspected whenever the blood pressure rises to 160 mm. Hg. Clinical signs are more reliable indices of its appearance than manometric readings of cerebrospinal fluid of hypertension. Severity of hematuria, urinary retention or amount of proteinuria cannot be correlated to the degree of acute pseudouremia.

The treatment of acute pseudouremia, or convulsive uremia consists in its early recognition and rapid use of dehydrating agents. It is by no means the hopeless condition that it was formerly regarded. Recently a number of effective dehydrating substances[26] have been brought forward that have completely changed the prognosis of this complication of acute Bright's disease. At the first indications of headache, apathy, or spots before the eyes, large amounts, 30-60 cc. of 50 per cent solutions of magnesium sulfate should be given by mouth. They may be repeated every four hours until a fall in blood pressure is obtained. If coma or convulsions supervene, more energetic treatment must be employed. Blackfan and McKhann[27] have obtained good results using 0.2 cc. per kilo of body weight of a 25 per cent solution of magnesium sulfate intramuscularly. In some of our early cases we have used this procedure with excellent results. Following the suggestion of the surgeons in treating head injuries, some have used 50 cc. of a

50 per cent glucose solution with considerable benefit. The secondary rise of intracranial tension as pointed out by Masserman[28] and the hyperglycemia are objections to this type of therapy. It has been shown experimentally that intravenous injections of hypertonic (50 per cent) solutions of sucrose reduce intracranial pressure for long periods of time, without any secondary rise in pressure. Further, sucrose is a foreign substance that is quickly removed from the body carrying with it a large amount of urine. Hahn, Ramsey and Kohlstaed[26] found intravenous injections of sucrose of definite value in the treatment of acute traumatic brain injuries of different types. Not alone did it effect and maintain a reduction of cerebrospinal fluid pressure but it also gave a moderate diuresis, and was considered by them a safe effective therapeutic measure. Considerable symptomatic relief of the distressing features of hypertensive encephalopathy has been noted by Murphy, Katz and Hersberg[29] using sucrose. Recently, we observed a patient who developed a dull headache, soon followed by convulsions lasting about five minutes and recurring every fifteen to twenty minutes. Intravenous injections of 50 cc. of a 50 per cent sucrose solution and a lumbar puncture gave prompt relief. The following day the sucrose was given again. She had a profuse diuresis and made an uneventful recovery.

Much can be achieved by proper prophylaxis. Postscarlatinal nephritis is perhaps the mildest form of the disease. Several things have accomplished this good result. Scarlet fever is recognized by all as a serious illness, so careful, skillful nursing care, including a prolonged bed rest is given most patients. The possibility of nephritis is in the physician's mind and the urine is examined daily. Hence, the nephritis is recognized and treated at its inception. While scarlet fever toxoid, antitoxin, and convalescent serum have done much to reduce the severity of the disease, apparently these measures are of no value in the prevention of nephritis.[30] In our series of sixty-one patients, scarlet fever was the antecedent in five cases, while upper respiratory infections were responsible for fourteen, septic sore throats for ten, otitis media five, polyarthritis four, and tonsillitis, sinusitis, and exposure to cold, each two. From this, it is evident that infections of the upper air passages are to be more circumspectly dealt with. "Colds" cannot be considered as trifling infections, but their potential dangers should be fully understood.

Removal of infected foci is important. In those cases where tonsils, teeth, sinuses, or other foci are the source of hemolytic streptococci, their removal by operative procedures is an important part of treatment.[31, 32] Tonsils are not to be indiscriminately removed, but only after they have been shown to harbor infective organisms. Acute streptococcal tonsillitis must be regarded as the primary or initial stage of the disease, glomerulonephritis the secondary or allergic stage of the disease. Pilot and Davis[33] have shown the Streptococcus epidemicus to be responsible for septic sore throat and have pointed out that carriers often account for sporadic outbreaks of the disease. Acute glomerulonephritis, as well as other diseases, frequently follows septic sore throat. They recommend tonsillectomy in patients known to harbor the Streptococcus epidemicus in their tonsils, as a means of preventing acute glomerulonephritis. When tonsils are to be removed they must be completely excised. "Stubs" or bits of remaining tonsillar tissue are capable of harboring streptococci and are as dangerous as though no removal were done.[34] The extraction of infective teeth demands special consideration. When more than one extraction is necessary, sufficient time must lapse between each operation. Removal of an infective focus carries with it the likelihood of bacteremia, and may act much like a vaccination. Sufficient time should lapse between extractions to allow this transient renal activity to completely subside; otherwise, multiple hasty extractions might be more harmful than the original foci of infection. The same rule applies to the operative treatment of sinuses, mastoids and middle-ears. These procedures may cause a transient increase in proteinuria, hematuria or urinary sediment, but they are not harmful when the above considerations are observed. Usually these operations are best done in the latent or chronic active stages rather than in the acute attack.

Ever since Löhlein[35] pointed out the association of streptococcal infections and acute nephritis, their causal relationship has generally been accepted. Soon after sulfanilamide was shown to be an effective agent against streptococcal infections we began to use it in acute Bright's disease. Some have reported excellent results with this drug,[36] but thus far our results have

been indifferent. In about half the cases it was used, it seemed to be very helpful, in the remainder it was ineffective. Apparently sulfanilamide was most helpful in those cases where there were active foci of streptococci. As long as these organisms were free or circulating about, the drug was of real assistance. However, in those patients that had passed to the secondary or allergic stage of the disease and streptococci were no longer active foci sulfanilamide was of no value. Sulfapyridine has not been used in our series because of the dangers of tubular concretions.[37-38]

Other medical agents are of no value; in fact they may be harmful. Diuretics are fair weather friends. In acute glomerulonephritis where they are urgently needed they are worthless. Occasionally the purine diuretics produce an oliguria in place of a diuresis.[39] Ammonium nitrate, ammonium chloride, or calcium chloride may result in acidosis rather than diuresis. Mercurial diuretics are definitely harmful. Three patients in our series had received intravenous injections of mercurials elsewhere before entering Research and Educational Hospital. All of them had a severe and prolonged acute attack, but they finally were completely healed. Hot packs and sweating procedures are no longer recommended because of their debilitating effects on the patients and their uncertain good in promoting diuresis.

CONCLUSIONS

The treatment of acute glomerulonephritis is largely nursing and dietetic. As soon as the disease is suspected, the patient should be put to bed and kept there until all signs of renal inflammation subside. Adequate food and fluid must be given to maintain body water and body weight. Early in the disease the Karrell diet works well, later more food is added to meet the caloric needs of the patient.

BIBLIOGRAPHY

1. Volhard, F. and Fahr, T.: Die Brightsche Nierenkrankheit, Berlin, Julius Springer, 1914.
2. Lichtwitz, L.: Praxis d. Nierenkrankheiten, ed. 2, Berlin, p. 235.
3. Nonnenbruch, W.: Die Therapie der "Kriegsniere," Munchen. med. Wchnschr. **65**: 611-612, 1918.
4. Volhard, Franz: Treatment of Acute Diffuse Glomerulonephritis, in Berglund, H. et al: The Kidney in Health and Disease, Philadelphia, Lea and Febiger, 1935, pp. 689-692.
5. Fishberg, A. M.: Hypertension and Nephritis, ed. 4, Philadelphia, Lea and Febiger, 1939, pp. 479-489.
6. Stone, W. J.: Bright's Disease and Arterial Hypertension, Philadelphia, W. B. Saunders Company, 1936.
7. Mosenthal, H. O.: The Diagnosis and Treatment of Variations in Blood Pressure and Nephritis, Oxford Monographs on Diagnosis and Treatment, New York, Oxford University Press, 1929, vol. 7, pp. 249-253.
8. Lyttle, J. D.: The Treatment of Acute Glomerulonephritis in Children, Bull. New York Acad. Med. **14**: 212-222, 1938.
9. Lueth, S. C.: The Management of Renal Disorders, J. Am. Dietet. A. (In Press).
10. Addis, T.; MacKay, E. M., and MacKay, L. L.: The Effect on the Kidney of the Long Continued Administration of Diets Containing an Excess of Certain Food Elements. I. Excess of Protein and Cystine, J. Biol. Chem. **71**: 139-156, 1926.
11. Keutmann, E. H., and McCann, W. S.: Dietary Protein in Hemorrhagic Bright's Disease. I. Effect upon the Course of the Disease with Special Reference to Hematuria and Renal Function, J. Clin. Investig. **11**: 973-994, 1932.
12. Naeraa, A.: Studies on Urinary Sediment. 3. Effect of High Protein Diet upon the Course of Nephritis with Special Reference to Urinary Sediment, Acta Med. Scandinav. **95**: 359-382, 1938
13. Addis, T.: A Clinical Classification of Bright's Disease, J. A. M. A. **85**: 163-167, 1925.
14. Pospischill; Dionys and Weiss, Fritz: Uber Scharlach, Jahrb. f. Kinderh. **72**: 389-394, 1910.
15. Jochmann, G.: Lehrbuch d. Infectionskrankheiten fur Artze und Studierende, Berlin, 1914, p. 668.
16. Murphy, F. D., and Rastetter, J. W.: Acute glomerulonephritis with Special Reference to the Course and Prognosis, J. A. M. **111**: 668-674, 1938.
17. Leiter, L.: Clinical Aspects of Renal Disease, Am. J. Clin. Path. **10**: 30-39, 1940.
18. Holten, C.: The Treatment of Acute Nephritis, Acta med. Scandinav., Suppl. **89**: 7-20, 1938.
19. Keutmann, E. H., and Bassett, S. H.: Dietary Protein in Hemorrhagic Bright's Disease. 2. The Effect of Diet on Serum Proteins, Proteinuria and Tissue Protein, J. Clin. Investigation **14**: 871-888, 1935.
20. Lin, S. H., and Chu, H. I.: An Optimal Diet in Promoting Nitrogen Gain in Nephrosis, J. Clin. Investigation **14**: 293-304, 1935.
21. Christian, H. A., and O'Hare, J. P.: General Considerations of Nephritis: Acute and Sub-Acute; Chronic Nephritis, in Oxford Medicine, New York, Oxford University Press, 1925, vol. 3, pp. 583-772.
22. Levy, I. J.: The Cardiac Responses in Acute Diffuse Glomerulonephritis, Am. Heart J. **5**: 277-290, 1930.
23. Langendorf, R., and Pick, A.: Elektrokardiogramm bei akuter Nephritis, Acta med. Scandinav. **94**: 1-34; 36-58, 1938.
24. Rubin, M. I., and Rapoport, M.: Cardiac complications of acute hemorrhagic nephritis, Am. J. Dis. Child. **55**: 244-272, 1938.
25. Master, A. M.; Jaffe, H. L., and Dack, S.: The Heart in Acute Nephritis, Arch. Int. Med. **60**: 1016-1027, 1937.
26. Hahn, E. V.; Ramsey, F. B., and Kohlstaedt, K. G.: Clinical Experiences in the Use of Sucrose instead of Dextrose in the Osmotic Therapy of Increased Intracranial Pressure Occurring in Cases of Acute Brain Injury, J. A. M. A. **108**: 773-776, 1937.
27. Blackfan, K. D., and McKhann, C. F.: Acute Glomerular Nephritis in Children: Treatment of the Cerebral Manifestations, J. A. M.A. **97**: 1052-1055, 1931.
28. Massermann, J. H.: Effects of Intravenous Administration of Hypertonic Solutions of Dextrose with Especial Reference to Cerebrospinal Fluid Pressure, J. A. M. A. **102**: 2084-2087, 1934.
29. Murphy, F. D.: Katz, A. M., and Hersberg, R.: Effects of Hypertonic Sucrose Solution on Patients with Hypertension, Abstract in J. A. M. A. **106**: 245-246, 1936.
30. Osman, A. A.: Studies in Bright's Disease; Value of Anti-Scarlatinal Serum in the Prevention of PostScarlatinal Nephritis, Guy's Hosp. Rep. **84**: 302-306, 1934.
31. Longcope, W. T.: Pathogenesis of Glomerular Nephritis, Bull. Johns Hopkins Hosp. **45**: 335-360, 1929.
32. Dean, L. W.: The Tonsils, Their Function and Indications for Their Removal, J. A. M. A. **103**: 1044-1048, 1934.

33. Pilot, I., and Davis, D. J.: Sporadic Septic Sore Throat, J. A. M. A. 97: 1691-1696, 1931.
34. Rhoads, P. S., and Dick, G. F.: Efficacy of Tonsillectomy for the Removal of Focal Infections, J. A. M. A. 91: 1149-1154, 1928.
35. Lohlein, M.: Uber Schrumpfnieren, Beitr. z. path. Anat. u. z. allg. Path. 63: 570-632, 1917.
36. Young, Hugh H., and Vest, Samuel A.: Treatment of Hematogenous Nephritis with Sulfanilamide, Ann. Surg. 108: 828-852, 1938.
37. Southworth, H., and Cooke, C.: Hematuria, Abdominal Pain and Nitrogen Retention Associated with Sulfapyridine, J. A. M. A. 112: 1820-1821, 1939.
38. Stryker, W. A.: The Nature of the Renel Lesion with Sulfapyridine Therapy, J. A. M. A., 114: 953-954, 1940.
39. Christian, H. A.: Some Studies of a Diuretic (Theocin), Arch. Int. Med. 18: 606-635, 1916.

TREATMENT OF COMPOUND FRACTURES

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Dr. Carlo S. Scuderi: The treatment of compound fractures which we are going to speak about, has been used in Cook County Hospital for fourteen years, and has been used by everyone on our service, including the residents, during that time. There is no secret about the treatment of compound fractures. Many men have methods of their own, and many of these we have tried and have been unsuccessful in their use. The fault is perhaps ours. Our method might not be successful in your hands.

The method we have been advocating is the emergency treatment of these compounds. If it is at all possible instructions should be given to police officers and ambulance drivers to splint the limb immediately at the site of the accident. The wound should be covered with a clean piece of whatever linen is available — handkerchief, shirt, or lingerie. The patient should be transported to the hospital immediately and not given any first aid in a doctor's office or corner drug store.

Upon arrival at the hospital the first thing is treatment of shock. If the patient is in shock, the fracture must of necessity wait. I have in my own experience treated a number of cases in shock, only to see them die in a few hours. We have made it a standing rule to wait six or eight hours if necessary until the patient has recovered from shock before proceeding further.

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Those who are not in shock, or those who have recovered from shock, are then treated as major surgical catastrophes — not in the dressing room or examining room by the least competent of the whole staff, the junior interne. This patient is going to have a return of full capability or is going to be a cripple for life, depending upon what is done within the next few hours.

The wound is covered with sterile gauze and the surrounding surface washed with soap and water. Some men like to use local anesthetic infiltrated through healthy tissues. We feel that the tissues have already gone through sufficient trauma and that local infiltration may be the deciding factor in giving an unsatisfactory result. This is purely our own opinion; we know that many men use local with excellent results. When the skin has been well washed and shaved, then and only then is the compound wound uncovered and surgically prepared with soap and water and a good brush. At this stage of the game it is advisable to have a large quantity of sterile solution at body temperature in an irrigator, and from time to time irrigate the area in order to clean it of dirt and blood.

Never fear to extend the compound area — we have had many disastrous results from pinpoint fractures, which give by far the greatest number of complications. We feel that every compound fracture should be opened wide enough so you can see every bit of the injured area. The skin which has been badly lacerated should be cut away. Skin which appears fresh and living should not be cut away even though it is against the margin of the fracture area. Then the wound is debrided from the skin down; the soft tissue first, the muscles next are cut away until you get back to healthy red twitching muscle. Close inspection should be made to see that the tendons and nerves are in normal condition. Should they be torn or ruptured they should be sutured.

After the wound is thoroughly irrigated with gallons and gallons of physiologic salt solution, then one's attention is directed to the bone. The bone itself must be thoroughly washed to get off any grease or dirt. If necessary the use of rongeurs to bite off contaminated bone is advisable. In most cases scrubbing with soap and water and irrigation with saline will clean up the area satisfactorily. Pieces of bone which have been detached from the surrounding tissue

are best removed. However, if they are attached to the periosteum or fascia, leave them in because if they do die they can be removed at a later date.

Some men advocate internal fixation by the use of a Lane plate, screws or wire. Our experience has been that it is best to keep away from inserting any foreign body if it can be avoided. A number of years ago Dr. Cubbins visited Dr. William O'Neill Sherman, who is, as you know, an advocate of plating, but in our hands we have had many unhappy results and have given it up. The maximum amount of foreign material to be used is not more than one screw. Some men like to close the wound tight. Our experience has been that no matter how much catgut you put in, there is always a certain amount of oozing and if you can minimize the amount of catgut there is a better chance of a clean wound. We close the wound loosely with interrupted sutures through the skin, bringing the edges as close together as possible, but leaving enough space so that the fluid will have a chance to escape onto the dressings. We put on large pads of absorbent cotton and use whatever form of immobilization is indicated. For a compound of the arm, a Kirschner wire; for the leg, a Steinmann pin. Some may be successfully treated by the use of a cast — that all depends on the surgeon's judgment.

We believe all these cases should receive tetanus anti-toxin, and all wounds contaminated with street dirt should get gas antitoxin. The dressings are changed as frequently as they become saturated — early, every two or four hours, and after the first twenty-four to thirty-six hours, only once a day. Dr. Zeiss and Dr. Reynolds did some work at County on compound fractures and their statistics show that about 85 to 90 percent. of all cases coming into the hospital remained clean. We formerly used iodine in these wounds, but due to the teaching of Dr. Koch we have given up the use of all antiseptics and use nothing but soap and water.

Dr Callahan will continue with the movie and the discussion on compound fractures.

Dr. James J. Callahan: There are one or two things I would like to emphasize. The first and probably the most important is the fact that compound fractures occur either from without in or from within out. We can see the amount of damage in the ones that occur from without in, and can take care of it, but it is the ones that compound from within out, and have the small puncture wound, that cause complications. The complications following compounds are by far much more important for the restoration of the limb than the original injury. I say that because so many of them come in with small particles of clothing or foreign material imbedded in one of these small openings, and I believe in a large incision being made if there is a small puncture wound or a compounded wound.

Dr. Scuderi mentioned the voluminous dressings we use. We never put a drain in because we believe that we are debriding to remove foreign material, and why put a foreign body back in? Frequently you will see dressings saturated and repeatedly reinforced by the resident, with tight bands on the pad. That is one of the most frequent causes of complications and infection in a fracture. The second is the use of skeletal traction. As you know this is indicated in most severe compound fractures, and little do we realize that it is responsible for most of our nonunions and injury to the surrounding tissues. If contact of the ends of the bone is lost, a few pounds of traction will cause nonunion. We frequently find fat embolism as a complication. You may think the veins have collapsed at the site of injury, and I agree. The fat comes from pressure on the canal, releasing the fat which is liberated into the system. If you will wait until edema or soft tissue swelling has subsided the chance of getting fat embolism is much less. That can be eliminated by skeletal traction, and that brings up the use of casts in connection with compound fractures, particularly the use of a cast immediately, without reduction, to immobilize the fracture so that more trauma or damage is not done.

We watch for early symptoms of gas. The skin nutrition comes later, but pain and swelling are often characteristic of gas. By the use of skeletal traction the symptoms can be detected earlier. X-ray is an excellent adjunct for the detection of gas in the tissues. I have a slide which I would like to show, which shows gas in the tissues. I do not want you to be misled and every time you see air think of gas. Gas follows the muscle plane and many times can be identified because it separates the fascia. You can see here how it completely infiltrates the surrounding areas.

As to treatment of B. Welchi infection, there have been quite a few articles written on its treatment x-ray, gas vaccine, etc. It is our custom to give these patients a prophylactic dose combined with tetanus antitoxin. However, if the wound is particularly dirty we will give a therapeutic dose of B. Welchi serum and repeat it in four hours. How much value it has been nobody knows, but we can say our cases of gas are very few. It must be remembered that B. Welchi is not the only gas forming organism.

When it does occur I believe the sutures should be removed completely and multiple incisions made and the area irrigated with Dakin's. The use of x-ray has not been satisfactory with us. Maybe we did not use it until too late. Results from some other places would lead one to expect that by using x-ray these organisms are completely killed. That in our experience has not been true I would advocate complete opening of the injured area.

Disarticulation into the knee is more satisfactory than thigh amputation because gas follows the fascial plane and I believe this method offers the best chance of recovery.

It is our opinion that cases complicated by osteomyelitis should be permitted to heal for at least nine months before any surgery is attempted. Then the use of autogenous pegs rather than screws and plates has been more successful in our hands than anything else. That is the only way we secure bony union following compound fracture. Our advice is to let union occur and then you should be able to pick out the small sequestra. I have a short movie which depicts some of the things I have mentioned.

WOUND HEALING

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The healing of a wound is the result of a natural process which under optimal conditions proceeds at a definite and measurable pace. It may be slowed up or stopped, but, in its early stages at least, cannot be appreciably accelerated. The search for wound stimulants, however, still continues, and the surgeon is prone to attribute to some chemical agent powers resident in nature alone. Healing depends upon healthy tissues capable of carrying out a complex growth process, an understanding of which should be the physician's first concern.

The healing of a wound may be divided into three phases. There is first the exudative phase or lag period during which time the tissues are soft and gelatinous, the sutures pull out easily, and the strength of union afforded by the fibrinous exudate is very low. The lag period lasts 4 or 5 days, and both experiment and experience have shown it to be extremely susceptible to wound complications. The strength of the wound during this time is not so great as that afforded by the sutures immediately after repair. Not only is the actual tensile strength of the union minimal, but the holding power of the tissues for the sutures drops progressively.

The second phase of healing, that of fibroplasia, begins almost abruptly on the 4th or 5th day and continues until the 14th-16th day, at which time the wound has attained the maximum strength afforded by connective tissue scar. Certain structures such as bone, tendon and fascia which require greater strength than that afforded by simple connective tissue, exhibit a third stage of healing, that of maturation or organizing differentiation. Evidence indicates that this phase also is preceded by a delay or lag of a few days and then at about the 19th-21st day after injury there occurs a differentiating process whereby the original strength of the tissue is reestablished. This phase continues for many months, and during this time bone and tendon are reformed into a structure almost indistinguishable from normal.

The surgeon has become increasingly conscious of the fact that wound healing depends upon healthy tissues, with a good blood supply and freedom from disturbing influences. The healing process is affected by many factors, some acting locally, others acting more indirectly by their effect on the surrounding tissues and on the general condition of the patient. An appreciation of these factors has had a profound influence on modern surgery.

I should like to discuss first those factors which act directly at the site of the injury, not that they are necessarily more important but

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because, in the acute injury at least, they become the surgeon's immediate concern.

Normal healthy tissues are the first prerequisite for healing, and anything which interfers with the vitality of the tissues tends also to interfere with repair. *Disturbances* of *blood supply* at the site of injury are a most important factor. Here we must consider not only damage caused by the injury itself whereby large or small areas of tissue have been rendered avascular, but also strangulation caused by tight ligatures and sutures which may likewise lead to necrosis. It is the surgeon's concern to determine the circulatory condition of the wound and to avoid producing local anemic areas as the result of his own efforts. Following closure of the wound, vascular stasis, edema and hemorrhage may also cause local circulatory disturbances. Venous return is often more impaired than is the arterial supply, and unless the veins are supported by a firm pressure dressing, reminiscent in its action of the Unna's paste boot, extensive devitalization and necrosis may ensue. This is seen especially in large skin flaps which become dusky and cyanotic unless measures are taken to prevent stasis. Edema and hemorrhage compromise the local blood supply and lower tissue vitality. The extensive gangrene of the skin which follows wringer injuries is due, to a large extent, to the subcutaneous and subfascial hemorrhage which characterize this condition. This complication may be largely if not entirely averted by the immediate application of a voluminous pressure dressing bandaged snugly over a large area. The circulation may be influenced by the position in which the part is placed following repair. The venous return, particularly in case of wounds of the extremities, is often markedly improved by slight elevation.

Irritants of various sorts lower the tissue vitality, prolong the exudative phase, and may even bring healing to a standstill. Here we think specifically of chemically active as well as inert substances which gain entrance accidentally or are placed intentionally within the wound. Chemical irritants are most often used intentionally as antiseptics to destroy contaminating bacteria. The complete failure of antiseptics in the last world war and the reports which have come to us from the recent conflict in Spain have served to emphasize not only the almost complete inability of antiseptics either to sterilize a wound or to cope with infection already present but also their harmful influence upon the healing process. Even when antispetic drugs are used, the surgeon should remember that they are simply bacteriostatic. For the actual destruction of bacteria the physician must still depend upon living tissues and viable body cells. The newer drugs such as sulphanilamide and its allied chemicals are not entirely harmless. Recent experiments with them leave no doubt but that when used locally they cause a delay in healing.

Mechanical or *chemically inert irritants* may be introduced either at the time of injury or during treatment. Foreign bodies may carry infecting organisms into a wound, or their simple presence may seriously interfere with healing. The removal of all accidentally introduced foreign material becomes the duty of the surgeon, and it is also his duty to put into the wound as small amount of foreign material as is compatible with satisfactory repair. The present trend toward the use of fine silk and other types of non-absorbable suture material such as steel and cotton is indicative of the attention which surgeons are giving to wound healing. Because of its irritating properties catgut has been greatly restricted in its use or even discarded by some surgeons in favor of silk. A great deal depends upon the size of suture material used. Bowers, Burns and Mengle have shown that in the case of catgut there is almost an inverse relationship between the reaction of the tissues and the rate of absorption. Very fine 5-0 catgut which produces very slight reaction remains a longer time in the tissues than do the larger sizes. The strength of suture material required to close and repair wounds is certainly much less than has been realized. Howes' experiments on the holding power of the tissues for the suture have shown that it is seldom necessary to use a suture with a tensile strength greater than 3½ to 4 pounds.

Drains also interfere with healing and have no place in the properly treated fresh injury. Collections of blood and serum may be prevented by careful hemostasis during operation and the pressure dressing afterwards; thus drains are unnecessary for that purpose. If the surgeon fears that infection will develop, the wound may be cleansed and left open to be closed later.

Hemorrhage and *blood clots* interfere with healing by preventing apposition of divided tis-

sues, by interfering with local circulation through pressure upon vessels, and after a few days at least by forming excellent pabulum for bacterial growth. Clinical evidence so overwhelmingly supports this position that experimental studies to the contrary (Gurewitch and Rewo) cannot be directly applied to clinical surgery. Even if infection does not occur, the fibrosis and adhesions which follow the organization of clots and of blood-soaked tissues should be sufficient argument for thorough hemostasis. Point ligation of bleeding vessels with fine ligatures, pressure hemostasis during the operation, and a voluminous pressure dressing afterwards prevent the troublesome oozing which may ruin or appreciably delay repair.

• *Accurate anatomic restoration* of divided structures lays the groundwork for rapid healing and early restoration of function. Where large gaps and dead spaces are present, the exudative phase is unduly prolonged, and weak repair results. However, the restoration of continuity should be secured with due respect to delicate living tissues.

• *Rest, support* and *protection* to the healing tissues until such a time as they may resume normal function have again been emphasized in the present European conflict. This is a basic principle common to most methods of wound therapy. During the exudative phase or lag period when the tensile strength is very low, motion and activity are especially harmful. The weak fibrinous exudate is easily disrupted, and the lag period may be greatly prolonged. During the period of fibroplasia the strength of the wound increases day by day, but the forming scar may be easily stretched, and its return in strength correspondingly slowed. With the prolongation of the lag period and disturbances in fibroplasia which come with activity, there is marked increase in reaction in and about the healing tissues, and a weak thick easily stretched and adherent union results. Areas of necrosis may develop within the grasp of sutures rendered tight by edema, and infection may occur in a wound which would otherwise have healed by primary intention. The length of time a wound should be kept quiet depends somewhat upon the wound and upon the tissues injured. Certainly, healing should be complete before full unrestricted function is permitted. Here we might well take a lesson from the cardiologist who has learned to restrict the activities of the patient to the limit of the functional capacity of his heart. In the case of a healing wound, immobilization is needed until the stage of fibroplasia is well under way, and this is never less than 12-14 days. If the exudative phase has been prolonged by some complication, such as infection or foreign body or lack of skin covering, the initial immobilization should be correspondingly longer, and no general rule can be laid down. For such tissues as regain their normal strength with simple connective tissue scar immobilization during the period of fibroplasia is sufficient. When, however, greater strength than that of connective tissue is required, support must be maintained for a longer period of time, a lesson certainly taught us in the management of fractures. There is some evidence which indicates that while up to the formation of a connective tissue scar complete immobilization is required, after this time restricted use in a supporting splint may be started. Such restricted use appears to promote the increase in tensile strength which occurs during the third phase of healing. In the case of the healing tendon, restricted use following an initial complete immobilization of 12-14 days promotes a more rapid increase in tensile strength than does continuance of the rigid immobilization. However, it must be emphasized that this use at first must be limited by a splint so that the tendon cannot be extended beyond the point at which it was originally fixed; otherwise, stretching of the union and increased reaction occur. It has seemed to me that the same principle underlies the ambulatory casts for ankle fracture, which allow restricted use within the limits of motion of the cast.

• Adequate *protection* also requires covering of the wound surfaces to prevent both mechanical damage and bacterial contamination. Closure and rest are common to almost any method of wound management. In the treatment of burns despite the numerous theories and explanations advanced for the efficacy of any method of treatment, the one element common to all is that of closure. Tannic acid and similar agents produce an impervious crust resistant to bacteria, and one of the disadvantages of these methods is that the brittle crust tends to crack and leads to exposure of the underlying raw surface. The open wound with broad exposure of susceptible tissue

not only heals very slowly but with the ever present danger of infection and the certainty of contracture and dense scarring. Primary closure of the wound, by suture or by skin graft if necessary, offers the best chance for primary reactionless healing. The need for protection and rest also dictate infrequency of dressings. Except for some very definite indication the initial dressing should not be disturbed until the exudative phase of repair is past; that is, until after the 5th day. Even then, there is seldom anything to be gained by changing the dressing on a healing wound until such a time as the sutures should be removed. No matter how carefully a wound is dressed it is impossible to do so without disturbing it mechanically and without exposing it to some danger from secondary contamination. Strict immobilization and non-interference with dressings are excellent protection against mechanical, chemical, and bacterial dangers.

Non-viable and *necrotic tissue,* by requiring to be absorbed or extruded, unduly prolong healing and favor infection and disaster. The excision of such tissues removes a pabulum upon which bacteria may feed and relieves the remaining tissues of the necessity of digesting, phagocytyzing or extruding it. Further, the surgeon should not leave in the wound large amounts of devitalized and avascular tissues as the results of his own surgery. It is this consideration which emphasizes the need for gentle handling of tissues, for sharp knife dissection, for delicate instruments, and careful retraction, for the avoidance of mass ligation and the abstinence from the use of tissue destroying chemicals.

The problem of *wound contamination* I have left to the last in discussing the local factors of healing. This has been done intentionally because whether or not infection will follow the bacterial contamination almost invariably present in a wound is largely dependent upon the other local factors. Wound infection is a complication of wound healing which depends upon the presence of pathogenic bacteria in susceptible tissues. It is a matter of both the seed and the soil. Healthy tissues may often cope with virulent bacteria while weak and devitalized tissues may fall prey to organisms of relatively low virulence. No artificial method yet known will sterilize a wound; only healthy tissues can do that. We do know, however, that careful mechanical cleansing will reduce the bacterial content to a level at which healthy tissues can cope with it, providing the cleansing can be carried out early enough. The length of time the organisms have been in the tissues is of great importance. If they have been present for a time less than their period of incubation, mechanical cleansing is possible. If the period of incubation has passed, the surgeon is dealing with an already established infection, and mechanical cleansing is both ineffective and dangerous.

Bacteria as found in nature seldom become invasive before 6 or 8 hours after their introduction into a wound. If the wound can be surgically cleansed within this period of time and repaired with a minimum of injury, the tissues can deal with those bacteria which are left. On the other hand, bacteria coming from human sources or from suitable culture media and already acclimated to growth in human body fluids become invasive in a very short period of time, and it is seldom possible to cleanse such wounds sufficiently well to permit closure. As examples of primary injuries associated with the introduction of human acclimatized bacteria, we can mention human bite injuries, an all too frequent sequel of fist fights and brawls. However, as Koch has so frequently emphasized, similar organisms can be introduced into the wound by talking or breathing over it with the unmasked mouth and nose. Many surgeons are becoming convinced that human acclimatized bacteria rarely occur as primary invaders and that most wound infections are due to secondary invaders from expired droplets from the nasopharynx, from fingers, unsterile instruments and dressings. Glove puncture during operation has been shown by Devenish and Miles to be as high as 24%, and a series of post-operative infections was traced by them to such a source. The prevention of such secondary infection is of paramount importance. The avoidance of undue exposure of the wound at all times, the need for adequate masking and for sterile instruments and supplies are evident requirements. Bactericidal irradiation of the operating room is a modern refinement which seems to be efficient but does not compensate for lack of attention to other factors. It must also not be forgotten that ultra-violet rays are also irritating.

The prevention of wound infection is a more complex problem than simply that of attempting

to remove or destroy bacteria in the wound or to keep bacteria from entering it. All those things which promote wound healing, and by so doing preserve or support the tissues and keep them in a healthy state, tend to prevent wound infection. When the surgeon has done all he can to remove or destroy contaminating bacteria, he still must depend upon healthy tissues to conquer those left and here "the best antiseptic is life."

The *general factors* which have to do with wound healing are becoming better understood and more intensively studied concurrently with developments in biochemistry. Many of these factors have long been known or suspected to exist but the demonstrable evidence both from clinical as well as laboratory studies is now at hand. In the main, the general factors come into consideration in the "poor risk" patient, who has become debilitated by a long standing illness and chronic undernutrition. Disturbed wound healing in the acute traumatic case may, of course, be due to a poor general condition of the patient; more often, however, it is some local factor which is at fault.

Age as shown by duNoüys is directly reflected in the curve of wound healing and this factor must be included in calculations on the rate of healing. Healing both as measured by return in tensile strength as well as closure of cutaneous defects varies inversely with the age. Shambaugh has found that post-operative suppuration is 30% more frequent in patients over 50 than in those under that age; and Beekman and Sullivan have shown that post-operative complications increase from the 3d decade onward. However, healing occurs even in the aged, and age alone is seldom a cause for serious delay in the process.

Nutritional factors, long recognized as of importance, have received considerable attention particularly from the standpoint of water and electrolyte balance, carbohydrate and fat metabolism, and the protein and various vitamin factors. The tendency to ascribe certain disease manifestations to one particular factor, especially to one or the other of the many vitamines, has made us neglect the general problem of nutrition in our search for specific factors. Meiklejohn has pointed out that most nutritional deficiencies are multiple, and while it is advantageous to split the problem up in order to study it more carefully, we should not forget the whole while examining the parts.

It has been shown experimentally that *dehydration* or *overhydration* affect wound healing adversely. This was recognized clinically for many years, but not until careful studies of blood and body fluids were available could the clinician determine accurately the fluid requirements of his patients. Similarly with *electrolytes*, particularly sodium chloride, the experimental and clinical laboratories have now made available accurate data and methods for determining the salt losses and requirements. The numerous contributions by Coller and Maddock and their associates have done much to clarify the whole problem. Careful watching of the patient before and after operation and maintenance of an optimum water and salt balance should obviate disturbances of healing due to these causes.

It has seemed to me, however, that too little attention has been paid to the loss of fluids which may take place locally, not externally but into the tissues in and about areas of extensive injury. The experiments of Blalock, of Parsons & Phemister, and others on traumatic shock have demonstrated that following extensive injury to an extremity, hemorrhage and fluid loss into the tissues may remove up to 40 or 60% of the total blood volume. This fluid loss may be partially prevented by the voluminous pressure dressing, which may thus have both a local and general effect.

The recognition and demonstration of the significance of *proteins* in wound healing is one of the most important of the modern developments in surgery. The effect of hypoproteinemia on wound healing is clinically demonstrated in patients on restricted diets, with gastro-intestinal conditions which prevent adequate food intake, with chronic protein loss from recurrent hemorrhage, persistent drainage from large raw surfaces or cavities, or increased protein demands because of sepsis. Delay in wound healing on low protein diets first demonstrated experimentally by Clark has been amply verified by Harvey and others. Extensive experimental and clinical work on this phase of the problem has come from Ravdin and his associates. These men have demonstrated the great depletion of blood proteins in starved and debilitated patients and have shown the effect of such depletion upon

wound healing and post-operative recovery. Methods of controlling hypoproteinemia have been described and discussed in a recent paper by Ravdin, Stengel and Prushankin. The contribution by Drew, Scudder and Papps on controlled fluid therapy presents in brief succinct form methods of determining and suggestions for controlling "the state of hydration of acutely ill persons."

The role of the *vitamines* in wound healing, first suggested by Sokolov in 1931, has since been abundantly verified by clinical and experimental observations. Lanman and Ingalls found low ascorbic acid levels in the blood of infants of the "underprivileged" class and were able to demonstrate the typical changes of scurvy in one infant which died following a wound disruption. Experimental work by them as well as by Taffel and Harvey and others have shown that low vitamin C diets in guinea pigs result in delayed development of tensile strength in wounds. Numerous clinical observations (Wolfer and Hoebel, Holman and others) have shown that patients on deficiency diets with obstructive gastrointestinal lesions, and a large percentage of patients in free hospitals in the large centers, frequently exhibit a low blood ascorbic acid; and evidence is accumulating that wound disruption and other complications of healing may be due, in part at least, to low vitamin C levels. In this connection, it must be remembered that vitamin deficiency in the clinical patient is not confined to a single vitamin but is probably always multiple and represents a general nutritional deficiency. Recent experimental work has shown that where vitamin deficiency can be restricted to C alone, with otherwise adequate diet and vitamin intake, changes of scurvy do not occur. Crandon and Lund report a personal experiment in which after 4 months on a vitamin C free diet normal wound healing took place.

General circulatory disturbances are also of some significance in wound healing, although it would appear that this factor is rather local in its action. *Syphilis* and *tuberculosis* are often blamed for retardation of healing. However, unless the disease is situated within the wound itself, there is no evidence that either of these per se causes delayed healing. Disturbances of wound healing in the adequately controlled diabetic are probably largely due to associated vascular disease.

The general factors which have to do with wound repair come into special consideration in the weakened and debilitated patient, the patient with a prolonged illness, a severe injury or an extensive burn associated with marked electrolyte disturbances, fluid and protein loss. In the great majority of instances, wounds heal with little or no disturbance so far as the general condition of the patient is concerned. The general factors must not be neglected, neither should they receive all attention at the expense of more immediately important local ones.

BIBLIOGRAPHY

1. Beekman, F., and Sullivan, J. E.: Analysis of Immediate Complications in 2,000 Cases of Inguinal Hernia. Surg., Gynec. & Obst., 68: 1052-1059, 1939.
2. Blalock, A., and Cressman, R. D.: Experimental Traumatic Shock. Surg., Gynec. & Obst., 68: 278-287, 1939.
3. Bower, J. O., Burns, J. C., and Mengle, H. A.: The Superiority of Very Fine Catgut in Gastro-Intestinal Surgery. Am. J. Surg., 47: 20-32, 1940.
4. Coller, F. A., and Maddock, W. G.: Water and Electrolyte Balance. Surg., Gynec. & Obst., 70: 340-354, 1940.
5. Crandon, J. H., and Lund, C. C.: Vitamin C Deficiency in an Otherwise Normal Adult. New England J. Med., 222: 748-752, 1940.
6. Devenish, E. A., and Mills, A. A.: Lancet, 1: 1083, 1939.
7. Drew, C. R., Scudder, J., and Papps, J.: Controlled Fluid Therapy. Surg., Gynec. & Obst., 70: 859-867, 1940.
8. Gurewitch, G. M., and Rewo, M. W.: L'influence des epanchements sanguins sur l'evolution de l'infection des plaies (Etude experimentale). Rev. de chir., 55: 555-566, 1936.
9. Holman, E.: Vitamin and Protein Factors in the Pre-Operative and Postoperative Care of the Surgical Patient. Surg., Gynec. & Obst., 70: 261-269, 1940.
10. Howes, E. L.: The Immediate Strength of the Sutured Wound. Surgery, 7: 24-31, 1940.
11. Koch, S. L.: Some Surgical Principles in the Repair of Divided Nerves and Tendons. Quart. Bull., Northwestern Univ. Med. School, 14: 1-8, 1940.
12. Lanman, T. H., and Ingalls, T. H.: Vitamin C. Deficiency and Wound Healing. Ann. Surg., 105: 616-625, 1937.
13. Meiklejohn, A. D.: The Diagnosis and Treatment of Nutritional Deficiency. New England J. Med., 222: 760-765, 1940.
14. Parsons, E., and Phemister, D. B., Hemorrhage and Shock in Traumatized Limbs. Surg., Gynec. & Obst., 51: 196-207, 1930.
15. Puestow, C. B.: Vitamines and Surgery. Internat. Abs. Surg., 70: 195-201, 1940.
16. Ravdin, I. S., Stengel, A., and Prushankin, M.: The Control of Hypoproteinemia in Surgical Patients. J. Am. M. Ass., 114: 107-112, 1940.
17. Shambaugh, P.: Postoperative Wound Complications. Surg., Gynec. & Obst., 64: 765-771. 1937.
18. Taffel, M., and Harvey, S. C.: The Effect of Absolute and Partial Vitamin C Deficiency on the Healing of Wounds. Proc. Soc. Exp. Biol. & Med., 38: 518, 1938.
19. Thompson, W. O., Ravdin, I. S., and Frank, I. L.: The Effect of Hypoproteinemia on Wound Disruption. Arch. Surg., 36: 600-508, 1938.
20. Thompson, W. D., Ravdin, I. S., Rhoads, J. E., and Frank, I. L.: The Use of Lyophile Plasma in the Correction of Hypoproteinemia and the Prevention of Wound Disruption. Arch. Surg., 36: 509-513, 1938.

21. Whipple, A. O.: The Essential Principles of Clean Wound Healing. Surg., Gynec. & Obst., 70: 257-260, 1940.
22. Wolfer, J. A., and Hoebel, F. C.: The Significance of Cevitamic Acid Deficiency in Surgical Patients. Surg., Gynec. & Obst., 69: 745-755, 1939.

THE TREATMENT OF INFECTED TRAUMATIC WOUNDS

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SPRINGFIELD

In discussing the subject of infected wounds I am going to limit my remarks to the care of traumatic wounds that from the start of treatment must be considered already infected or certain to be so complicated. What wounds should we classify in this manner? The mere presence of bacteria on the wound surface does not mean that they are infected. All wounds have bacteria on their surfaces, whether they are made intentionally under aseptic precautions or made accidentally without regard for asepsis. As long as the bacteria remain on the wound surface they contaminate the wound. As soon as they invade the tissues beneath the surface they infect the wound. Some general surgeons are now so conscious of this contamination of operative incisions that they are advocating soap and water cleansing of all such wounds before closure, even advocating a special soap for this procedure.[5]

The incubation period that separates the stage of contamination from that of infection is usually considered to be from 6 to 8 hours after the inception of the wound. This time, of course, is necessarily an average time because the invasive power and rate of different organisms vary. Usually bacteria of human origin are more rapid in their invasion and a virulent infection may develop in a few hours. (A recent British study of some of the World war wounds showed that 15% of the cases were obviously infected with the hemolytic streptococcus on admission to hospitals after an average of 12 hours from wounding. In a much greater number the infection was evident after a day or two, in some instances running to 90% of organisms causing the invasion. Colebrook states that this one organism was responsible for about 70% of the deaths from wound infection and caused most of the serious infection complications.[17]) Some wounds are contaminated by these virulent bacteria at the time the wound is caused. In many instances, however, these organisms gain entrance to the wound when first aid measures are attempted or improper examination of the wound is made. It is necessary then for all of us to limit our first aid attempts to covering the wound with a sterile dressing until we can prepare ourselves, our instruments and surroundings for an aseptic approach to the wound. Some wounds are so badly soiled that from the start we know they will have bacterial invasion below the surface and it is unwise to close them even after the most careful cleansing and debridement.[3]

We may consider a wound infected when it has not received treatment for six to eight hours after inception or is so soiled that removal of contamination is impossible.

We should approach this infected wound as carefully as though it were clean. The operator should be scrubbed, gowned and gloved to prevent the introduction of any virulent organisms from his person. The skin about the wound should be shaved, washed with soap and water and the area draped before the dressings are removed. All instruments must be sterile and should be used but once. Surface toilet should consist of removal of dead tissue, foreign bodies and blood clots. In the normal process of repair, when the space between the two wound surfaces has been bridged by healthy granulation tissue and all debris has been absorbed, bacteria can no longer grow and produce infection because of the high degree of immunity exhibited by young fibroblasts and angioblasts. If, on the other hand, the accurate apposition of the healing surfaces is prevented by the presence of blood clots, serum, or devitalized tissue, then excellent culture media is provided on which bacteria may grow unchecked and from which they may invade surrounding living structures.[4] Hemorrhage which has continued from the injury or caused by the cleansing efforts should be stopped by pressure or fine ligature. All tissues must be handled carefully. Cannaday[5] has said that theoretically the tissues of open infected wounds deserve more careful handling than clean wounds because they will be without the protective covering of the skin. The surface and pockets of the wound should be cultured to determine what organisms

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are present. Meleney has for several years been directing our attention to the importance of knowing accurately what organisms are on the surface of the wound and contributing to or causing the infection. During the last few years we have learned of several chemicals that have the effect of improving the patient's ability to combat certain infections. To make use of these agents and to be able to use them intelligently we must know what organism is to be combatted. The usual culture is made for the study of the aerobic bacteria. Many anerobic or aerophilic organisms are present in pocketed, undermined or deep tissue wounds and their presence will not be found unless special cultural methods are used.

If tendons or nerves are severed it is unwise to attempt their immediate repair in a wound that is infected or that undoubtedly will become so.[11] In this situation it is well to give care to the wound to promote rapid closure with a minimum of scar and plan a secondary tendon or nerve repair at a later time. (Bunnell[12] has introduced non-irritating removable fine steel wire for the repair of finger tendons and states that it is possible in some instances to do a primary repair of tendons as late as twenty-four hours after injury.)

If a fracture complicates the wound, the bone and periosteum should be cleansed, soiled bone being sacrified. Any large piece should be saved even if completely detached. It is now possible to use vitallium in various forms for the internal fixation of such fractures, if this procedure does not require much operative manipulation. The fracture should be aligned and held in position by skeletal fixation. We use plaster around large Kirschner wires, the wires being placed through normal tissues at some distance from the wound. The wound is then held open with a vaseline pack over which absorbent dressings are applied. One of the most interesting reports of treatment of a large number of infected Spanish war wounds shows the efficiency of this type of treatment. Josep Trueta of Barcelona treated over 15,000 wounds of the extremities, many being compound fractures and most of them considered infected wounds by the standards I set at the beginning of the paper. In brief, he clears away all bruised tissues being careful to preserve as much skin as possible and all large bony fragments. The cavities are left open and packed with gauze; a cast applied over the skin immobilizing the joints above and below the injury; the cast not removed until the development of intolerable odor or soaking of the cast by drainage. All cases were given gas gangrene tetanus antitoxin. The fear that such a treatment of fractures must lead to an increase in sepsis, especially gas gangrene was found to be groundless, and the method, by facilitating evacuation of the patients and dispensing with apparatus had great advantages under war conditions. In 1075 cases that he was able to follow there were 6 deaths, only 2 of which were due to gangrene. He reports good results in 91% of cases.

An infected wound should never be closed. Should it be drained? If there are pockets in the wound or dissections along fascial or muscle planes that will not be benefited by gravity drainage, it is usually wise to insert Dakin's tubes and continue Dakin's technique until the wound bacterial count has shown a satisfactory decrease and until all devitalized tissue has been removed by this chemical debridement. If dead tissue or bone has been removed and a dead space exists between the deeper layers of the wound that cannot be closed by elastic pressure on the wound edges, I have found the vaseline pack of great value. Orr[6] popularized the use of this pack in the treatment of the open wounds following removal of the sequestrae of osteomyelitis. It is surprising how rapidly an infected wound will fill with healthy granulations if this pack is correctly applied and left alone for several weeks. This pack is not placed for the purpose of effecting drainage but is introduced to exert pressure against the walls of the wound thereby suppressing exudation and stimulating granulation tissue. If vaseline or rubber strips are inserted for the purpose of drainage they should be removed by 48 hours and not replaced. (I have noticed around the local hospitals, daily dressing of infected pocketed wounds, drains pulled out and reinserted, usually without preparation of the surrounding skin field. I believe this procedure is unnecessary and an almost certain way of introducing additional organisms into the wound.) Koch[15] has recently made this significant statement concerning the drainage of wounds. "If the wound opening is adequate and well placed, drainage will continue as long as exudation is present. If it is not, insertion of a drain will not compensate for the error." Even

superficial wounds should be dressed with the idea of facilitating drainage. Here wet dressings changed frequently enough to prevent drying of the wound secretion will be effective. Isotonic salt solution is really better for this purpose than most any other solution, because its prolonged use does not cause tissue edema and maceration so frequently seen when boric or plain water packs are used.

The use of chemicals in an effort to prevent and cure infections in wounds has received impetus during the last few years since we have had experience with the 'magic bullets,' sulfanilamide and sulfapyridine. Numerous reports of lowered morbidity in wounds which were treated with these chemicals have appeared.[8, 10] The use of sulfa-thiazol should give still better results since it is effective against the staphylococcus and certain anaerobes as well as against all of the organisms that the other chemicals combat. The usefulness of these substances seems to be in preventing infection in wounds, the bacteriostatic action of the chemical delaying bacterial invasion and allowing a longer time for the natural body defense mechanism to get effectively into action. How effective these drugs will be locally after the wound is once infected has not been reported. Their general administration to a satisfactory blood concentration is indicated if wound culture shows the presence of an organism susceptible to their action. There is a great deal of doubt about the necessity or value of the use of antiseptics on the dressings. These drugs in the dressings may prevent outside organisms from getting into the wound from the surrounding skin but there is evidence to show that most of them are harmful to the surface cells of the wound. Recent studies show merthiolate less toxic than phenol, iodine, merchurochrom and metaphen but not an ideal antiseptic because it is more toxic to connective tissue and epithelial cells than to bacteria. McClure reports the mercurials, bichloride, metaphen and merthiolate, as having a high toxic coefficient, with the cresols and hexylresorcinal relatively low. Meleney has proven the value of the use of zinc peroxide where contamination with anaerobic and micro-aerophilic organisms is suspected or proven by culture. This chemical is an oxidizing agent and must be applied as a creamy suspension in sterile distilled water to every part of the wound surface. When delayed closure of such a contaminated wound seems advisable, it may be packed wide open with gauze saturated with zinc peroxide. I have found this material of great value in cleaning up dirty wounds, especially wounds about the mouth. The method has the disadvantage of requiring daily dressings and the changing of packs because the material is active for only 24 hours.

For wounds infected with B. pyocyaneous, acetic acid wet dressings are sometimes indicated. There are a few organisms against which we have specific bacteriophage. Moist phage dressings are indicated in these cases. Occasionally a wound has in it devitalized tissue that cannot be removed surgically because of possible damage to nearby vital tissues or because of the danger of breaking through nature's inflammatory defense wall. In these cases some of the protein digestants may be of value. It is now well established that the introduction of maggots into a suppurating and poorly healing wound definitely assists in the process of healing. Part of this beneficial effect can be attributed to the fact that the maggots remove necrotic tissue and thus clean the wound, making it poorer soil for the growth and proliferation of pyogenic organisms. Investigation has shown that allantoin is excreted by maggots, and that it greatly promotes the healing of infected wounds. Urea in a 2 per cent solution is also efficacious in the treatment of such wounds. It is well known to biochemists that strong urea solutions are excellent solvents for protein material. Many investigators agree that concentrated solutions or even crystals of urea are superior to the dilute solutions first employed. The advantages of this treatment is its low cost of freedom from tissue irritation. It is absolutely nontoxic. Robinson[13] has recently advised using 2% sterile solutions of ammonium bicarbonate for dressing wounds where tissue digestion is helpful. He feels that the effectiveness of maggot therapy in such wounds was their ability to form urea which was acted upon by urease to form ammonium bicarbonate. This substance is very effective in the digestion of protein. It is nonirritating to living tissue.

(Loehr reported using cod liver oil dressings for burns in 1934. Since then he had advocated this substance as a dressing for infected wounds. The substance in the oil which is responsible for the ability to improve the healing of chronic and infected wounds was first thought to be the

Vitamine A. Subsequent investigations seem to indicate that the unsaturated fatty acids are the active constituents. In fact, an excess of Vitamine A applied locally seems to retard wound healing. Getz[14] has studied the effect of various oils on the healing of chronic tuberculous ulcers and has made these interesting findings. Healing was more rapid in the animals treated with cod liver oil. Paraffin, lanum, olive and cottonseed oils were inactive. Halibut and tuna liver oils were slightly less potent than cod liver oil in spite of having a higher vitamine content. The saponifiable fraction was irritating and suppressed healing while the non-saponifiable fraction caused more rapid healing than the whole cod liver oil. This fraction also seemed to have a systemic effect in combating the tuberculosis. The active principles were shown not to be either vitamines A or D.)

In closing my comments on the use of antiseptics in wounds, I would remind you of a recent timely statement of Koch.[15] "Sterilization of the wound area must take place before healing can proceed with any degree of rapidity. The most important single factor in hastening sterilization is simple cleanliness. To permit macerated epithelium, encrusted wound secretion and coagulated blood to cover skin edges and the area about a wound is to provide favorable conditions for bacterial growth. Too often the surgeon satisfies his conscience by pouring an antiseptic solution over the wound area day by day, and convinces himself that he is 'treating' the infection."

The primary dressing should be applied in such a manner that we make use of all of the procedures known to improve tissue metabolism and to prevent spread of infection. Our first object is to get the wound surface covered with healthy granulation tissue. In making this dressing I use a fine meshed gauze or sheeting that has been impregnated with vaseline. This is applied over the raw surface and fluffed gauze is packed over it in sufficient quantity so that when an elastic bandage is applied there will be slight even pressure over the entire wound. The portion of the body which has been wounded should be immobilized sufficiently to give absolute rest to the injured area while active infection is present. This immobilization is effected so that movable parts of the body are in the so-called positions of function. It is well to allow gravity to aid venous circulation by slightly elevating the wounded area. This is especially important in extremity wounds. It is well to keep the temperature of the body about the wound at a constant high level by a heat cradle. Tissue resistance is higher and metabolism is better at temperatures between 98 and 100 Fahrenheit.

After the wound has been cleaned and dressed, it should be left alone as long as possible. The odor of the exudate or the discomfort occasioned by its presence will usually force the surgeon to redress the wound every three or four days. The wound should be left alone but not forgotten because during the first few weeks, at least, we must be careful not to delay in our detection of such complications as gas bacillus infection or cellulitis. An elevation of pulse or fever should call for an inspection of the wound and surrounding tissue. When a wound is Dakinized, more frequent dressings are necessary. If wet dressings are applied to a wound surface with the idea of facilitating drainage, they must be changed often enough to accomplish that purpose.

There is as much need for care in preventing outside infection entering the wound when it is being redressed as there was at the time of primary care. David[16] has recently written an editorial on the need for careful dressing and points out that "If the skin surrounding an infected wound is treated as if it were potentially a sterile field, the wound itself is spared contamination by shifting dressings. The granulation tissue contains most of the fighting forces of the body against infection. Left to its own devices and protected from constant recontamination, it soon demonstrates its ability to combat the infection upon it. The result is a wound covered with a red, healthy bed of granulation tissue, with all evidences of healing."

The granulation tissue covering the wound should be covered with skin as soon as active infection has subsided and dead tissue has been eliminated. This can be accomplished by pinch grafts in the presence of slight infection or a large perforated split thickness graft if the wound is relatively clean. Early skin grafting on a suitable surface prevents tissue scarring and loss of function of underlying structures and greatly shortens the time of convalescence. When the wound has been covered by skin, our job is only partly over. If the wound has been on the extremities, the immobilization and inactivity

that the treatment has caused has resulted in weakening of muscles and stiffening of joints. As soon as active infection has subsided the joints and muscles should have periods of active exercise and as soon as skin covers the wounld, warm baths and light massage should be given until there has been a satisfactory return of function. Neglect of this part of the treatment may result in joint or muscle stiffness that may remain as permanent disability.

In our concern for the care of the wound we must not lose sight of the fact that the local resistance of tissue to infection and the rate of wound healing depend a great deal on the general condition of the patient. To increase the body's resistance to the pathogenic anaerobes we routinely use gas gangrene tetanus antitoxin, 3,000 units intramuscularly at the time of first dressing and a similar dose on the third day. A diet high in protein elements raises the ability of the body to resist infection and increases the rate of wound tissue growth. This type of feeding is given routinely to our cases with open wounds. Dehydration definitely delays wound healing and the fluid balance should therefore be accurately controlled at all times. Vitamine A in adequate amount is necessary for proper epithelial metabolism. Vitamine C is apparently necessary for the laying down of the intercellular substance in wound healing. Anemia or a low blood protein is liable to develop in a patient ill with an infected wound. The onset of either condition seriously reduces the patient's ability to resist the infection or heal the wound. Blood and serum transfusions are so easy to give that there is no excuse for letting a patient remain under this handicap. We routinely give our fracture patients a quart of milk a day to insure adequate calcium and phosphorus intake. We also give Vitamine concentrate to patients who have a poor appetite or who are going to be ill for a few weeks or longer.

Summary: 1. The wounds when first seen must be relieved of all foreign material such as foreign bodies, blood clots or dead tissue.

2. The wound should be left open and treated by Dakin's dressings or some modification of Orr's technique.

3. The injured area should be immobilized, dressed with slight pressure and elevated if possible.

4. The wound should be cultured for aerobic and anaerobic organisms. If a specific form of chemical therapy is available for the organism found it should be used.

5. There is no need for the routine application of antiseptic solutions to the wound itself.

6. The patient's general condition should be carefully watched and and kept near normal conditions.

DISCUSSION

Dr. Sumner Koch, Chicago: It is most encouraging that in a meeting of the Surgical Section of our State Society we should have a number of papers that concern such vital and basic considerations as wound healing and the care of infected wounds. I find myself in complete agreement with both essayists, and anything I might add would be in the way of emphasis.

Dr. Mason spoke of the importance of pressure dressings. That term may convey to some of us a false meaning. We have all seen the harmful effect of pressure over bony prominences, and pressure sores resulting from rigid pressure on unprotected tissues. What Dr. Mason has in mind, I am sure, is an elastic and uniform tension over the entire wound area. Such pressure is an important factor in maintaining the circulation, in preventing venous congestion and so in hastening healing.

Perhaps one of the simplest illustrations of such pressure is the dressing that we apply over the chest wall after operations on the breast. I have some unhappy recollections of patients in whom within twenty-four or forty-eight hours after a radical operation on the breast a large accumulation of serum had formed underneath the skin flaps. The incision had to be opened to permit the serum to escape, and the whole postoperative course was complicated and recovery delayed by the necessity of repeatedly opening the wound to permit escape of accumulations of serum. We have learned that such complications can be prevented by compressing the entire wound area with a large dressing of fluffed gauze and by strapping it securely so that it produces elastic tension over the entire wound area. If such a dressing is left undisturbed for from four to six days, one finds that healing has progressed, that flaps remain adherent to the underlying tissue, and that the wound area is firm and flat when the dressing is removed. The term pressure bandage may perhaps have a false implication, and I am sure what Dr. Mason has in mind is a dressing that produces uniform and elastic tension.

I was glad to hear Dr. Lewis mention first aid treatment and the importance of protecting the open wound with a sterile bandage and of stopping there. It is a principle we are trying to teach our residents and internes at the County Hospital where one sees so many open wounds. After a simple sterile dressing and bandage are applied the patient is taken to the

ward dressing room, operating room, or some place where the wound can be given adequate care under aseptic conditions, — in other words, the same care that he would receive if he were to have an appendectomy or herniotomy. Time and again we have seen patients with extensive wounds which have received only the first aid treament described before being taken to the operating room. We have seen such wounds heal kindly and by primary intention after very extensive and tedious operations. Too often we have seen the other side of the picture — wounds probed, disinfected, sutured without any serious attempt to maintain strict surgical cleanliness. Invariably such wounds have become infected.

If I could emphasize one paragraph of the many excellent ones in Dr. Lewis' paper, I would stress the first aid treatment that covers the wound as quickly as possible, that prevents infection from the uncovered mouth and nose of surgeon and bystanders, and so gives the best opportunity for transforming the contaminated wound into a clean wound.

BIBLIOGRAPHY

2. Mason. S. G. &. O. Int. Abs. of Surg. 69: 112, 1939.
3. Estes. Discussion of Paper of Dr. Cannaday. The Am. Jour. of Surg. 47: 377, 1940.
4. Urban Maes. S. G. &. O. Int. Abs. of Surg. 69: 114, 1939.
5. Cannaday. Am. Jour. Surg. 47: 377, 1940.
6. Orr. S. G. &. O. 45: 446, 1927.
8. Jensen, Johnsend and Nelson. Surgery, Vol. 6, p 11, July, 1939.
10. Cannaday. Am. Jour. Surg. 48: 377.
11. Mason. S. G. & O., 70: 392, 1940.
12. Bunnell. Am. Jour. Surg. 47: 502, 1940.
13. Robinson. Am. Jour. Surg. 47: 3.
14. Getz, quoted by Ivy and Gray. S. G. & O., 66: 232.
15. Koch. Internat. Abs. of Surg. S. G. & O., 66: 110.
16. David. Surgery, Vol. 5, No. 2. p. 275. Feb. 1939.
17. Colebrook. Brit. Med. Jour. March 16, 1940. p. 4488.
18. Josep Trueta. Lancet, 1: 1452, 1939.
19. Orr. Arch. of Surg. 40: 825, 1940.

EVALUATION OF ACCOMMODATION AND CONVERGENCE IN REFRACTION

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INTRODUCTION

A successful refraction must take into account factors other than the cycloplegia, retinoscopy and the subjective testing of the eyes for the ametropia. In addition to the above, the accommodation range, muscle balance and the muscle strength must be known in order to evaluate properly the refractive error which is revealed in the examination.

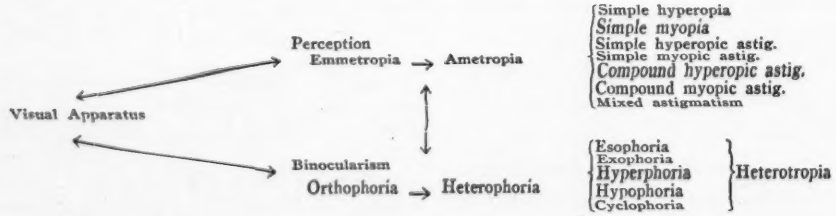
Since the literature on the subject of accommodation and convergence is that of complicated physiologic optics and mathematics it seems best to approach the subject from a purely clinical standpoint by emphasizing the twofold mechanism of which the visual apparatus is composed, and to carry a patient through the entire eye examination from the testing of the visual acuity to the writing of the prescription for glasses.

Read before Section on Eye, Ear, Nose & Throat, Illinois State Medical Society, May 22, 1940, Peoria.

VISUAL APPARATUS

The visual apparatus as diagrammatically presented is a twofold mechanism. Either mechanism may be the problem at fault in producing the asthenopia, or there may be present a combination of the two factors. With the perceptive mechanism we see, and with our binocularism we fuse and interpret the images which are perceived. This discussion is concerned with the binocularism and the manner in which the emmetropic or ametropic eyes function in a normal or abnormal binocularism.

The perfect human eyes, emmetropic and orthophoric are rarely found. Minimal amounts of astigmatism and mild muscle imbalances, particularly exophoria for near, are the rule. However, in the range of physiologic activity the eyes tolerate the minimal errors with no discomfort.



The anatomical eyes with their perceptive mechanisms follow hereditary patterns and hyperopia and myopia are even predominant in certain racial groups. Astigmatic errors seem to follow the same general hereditary patterns and it is not a rarity to find the identical astigmatic error in several direct generations.

The binocular mechanism (stereopsis — convergence and divergence movements) which man acquired late in his phylogenesis is very vulnerable and this mechanism is also subject to hereditary influences. Variations from the normal occur almost universally. Orthophorias are relatively rare and heterophorias of one type or another are the rule. Heterotropias merely represent a further stage of the heterophorias.

Since the eyes must work in the framework or environment of their binocularism it is necessary to interpret the patient's symptoms by fully evaluating the heterophoria and also the accommodation range. These examinations must be complete and not too time consuming. The muscle balance may be tested with either the Maddox rod or displacement with prisms, and is usually done without the correction of the refractive error before the eyes. One evaluates and prescribes for the refractive error in the framework of the muscle findings. The framework as outlined below is simple and sufficiently comprehensive for a thorough refraction. A phorometer with its Maddox rod and rotary prisms is, of course, time saving, though the apparatus is not entirely necessary.

on the record will focus one's attention to the abnormalities. This is especially helpful in future examinations since one will see the patient's trouble at a glance.

EXAMINATION

The examination is as follows: The visual acuity of each eye is taken first and the accommodation range for each eye is tested. Then by the simple screen test one finds orthophoria, heterophoria or heterotropia. The ocular excursions are noted and this may reveal paresis or paralysis in any of the cardinal positions. Lastly, by the patient looking at a light or a small fixation object as it is brought toward his nose one records the convergence in centimetres and finds it clinically to be good, poor or absent.

The phorometer is then placed before the eyes and the muscle balance is tested at 20 feet. This is determined with a Maddox rod. The bulb light for the test can be green in color. A red glass is placed before one eye while the Maddox rod is placed before the other. This gives the striking contrast of a red light and a green line and eliminates the confusing reflections which may come from windows in the examining room. The ductions are determined next and they are tested separately in each eye — despite the belief of some that the same types of ductions are identical in both eyes. One does find differences in duction in both eyes in a small number of cases when these tests are done routinely. When ductions determinations are reserved as very special tests in only a small percentage of patients, one may find the figures for abduction or adduction the same for both eyes in that small group of patients. It is not difficult, therefore, to understand that an examiner would come to false conclusions regarding the

THE FRAMEWORK OF THE REFRACTION

Visual acuity: R___ L___ Accommodation near point: R___cm L___cm Cover test (orthophoria (heterophoria (heterotropia Convergence near point (pc) ___cm (good (poor (absent

Muscle balance
(without correction) at 33 cm_____ at 6 meters_____

Muscle strength: Abduction R_____ L_____ Adduction R_____ L_____

Cycloplegic refraction — retinoscopy — subjective testing.
Postcycloplegic test.
Recheck of muscle balance with correction to test the influence of the correction on the muscle balance.
Prescription and final check up of glasses.

Esophoria — SO. Exophoria — X. Duction means prism duction and where figures are noted the symbol Δ is implied. A circle drawn about abnormal findings

figures obtained, since his very limited examinations could not cover all types of cases. Perform these tests on everyone and the differences in the abduction and adduction in both eyes will be noted in some cases. The perplexing problem then arises in those particular cases as to which figures to favor in evaluation of symptoms, the lower or the higher.

Duction is determined by placing the apex of the prism over the muscle to be tested and increasing the prism strength until diplopia results. The test should be done slowly so as to get the maximum strength of the muscle. In using the rotary prism with quick motions the fusion may be broken with a lesser amount of prism than would obtain were the test performed slowly. The abduction and adduction for each eye are noted. As a rule I do not concern myself with the sursumduction or deorsumduction unless a vertical imbalance is found. Finally, the muscle balance is determined at 33 cm, the object of fixation being a vertical arrow placed at right angles to a horizontal line drawn on a white card. If one were to test the muscle balance at 33 cm before the testing at 20 feet, the accommodation might be stimulated sufficiently to alter the findings at 20 feet. The lateral muscle balance at 33 cm is determined with prism displacement because the Maddox rod and light have been found to stimulate accommodation while the balance is being tested. A ten degree prism base up before one eye will break the fusion and the false image (arrow and line) which is displaced downward will be either to the right or left of the true upper image depending on the presence of either an exophoria or an esophoria. The amount of muscle imbalance is measured by bringing the arrows of the true and false images directly in line with one another. Muscle balance determination with the Maddox rod at 33 cm reduces the exophoria findings and increases the esophoria. For the testing of the vertical muscle balance at 33 cm the Maddox rod is employed because of the simplicity, though prisms can be used. A base in prism would be preferable here because a smaller prism is required to break the fusion in abduction rather than a larger prism base out in adduction. One must always bear in mind the presence of a physiologic exophoria of several diopters and ignore it when all the other findings are in the normal range.

INTERPRETATION AND EVALUATION OF FINDINGS IN FRAMEWORK

Except for the cyclophorias all of the muscle imbalances will come under any of the six groupings. Group III is most commonly found and next in frequency is Group I.

Group I

ESOPHORIA (convergence excess)

Muscle balance at 33 cm SO[6] at 6 meters orthophoria

Muscle strength. Abduction $\frac{R\ 5}{L\ 5}$ normal action

Adduction $\frac{R\ 25}{L\ 25}$ excessive action

The above findings are those of *esophoria* on the basis of a *convergence excess* due to *excessive action of the adductors.* The abductors are normal.

Treatment consists in crowding the correction to relax the accommodation, in that way permitting the convergence to let go. In the post cycloplegic test the hyperopic findings are reduced very little, even to the point of giving less distance vision with glasses than that obtained when the subjective testing of the eyes was done under cycloplegia.

Prisms base out are of no help.

Group II

ESOPHORIA (divergence insufficiency)

Muscle balance at 33 cm SO[1] at 6 meters SO[7]

Muscle strength: Abduction $\frac{R\ 2}{L\ 2}$ deficient action

Adduction $\frac{R\ 12}{L\ 12}$ normal action

The above findings are those of *esophoria* on the basis of a *divergence insufficiency* due to *weakness in the bilateral abductor action.* The adductors are normal. Since the abductors have their greatest action in the distance field an esophoria at six meters is apparent with weak abductors while in the near range there is the tendency toward orthophoria for the adductors are normal.

Treatment consists in moderately crowding the hyperopic correction obtained under the subjective testing of the eyes with cycloplegia, in order to relax the accommodation and convergence.

Prisms base out for the distance correction, only, may be of some benefit.

Group III

EXOPHORIA (convergence insufficiency)

Muscle balance at 33 cm X^{10} at 6 meters X^{8}

Muscle strength: Abduction $\frac{R\ 6}{L\ 6}$ normal action Adduction $\frac{R\ 5}{L\ 5}$ deficient action

The above findings are those of *exophoria* on the basis of a *convergence insufficiency* due to *weakness in the bilateral adductor action.* The abductors are normal.

Treatment consists in generously cutting the spherical correction obtained under cycloplegia in order to stimulate the accommodation and convergence.

Orthopsis is very helpful in these cases.

Prisms base in may be used with benefit.

Operation consisting in recessing both externi should be done in cases which are not benefited by the more conservative measures.

The above findings may be found in patients with emmetropic eyes and their symptoms are caused by the *weak action of the extraocular muscles.* The ability to maintain orthophoria is due to the excessive nervous energy which these people expend in the exercise of their accommodation and convergence functions. It is in this

Group IV

EXOPHORIA (divergence excess)

Muscle balance at 33 cm X^{4} at 6 meters X^{9}

Muscle strength: Abduction $\frac{R\ 18}{L\ 18}$ excessive action Adduction $\frac{R\ 14}{L\ 14}$ normal action

The above findings are those of *exophoria* on the basis of a *divergence excess* due to *excessive action of the abductors.* The adductors are normal.

Treatment in this type of case presents special problems. Generously cutting the spherical correction obtained under cycloplegia in order to stimulate the accommodation and convergence does not alter the problem very much for the difficulty lies in the distance range. This procedure, however, should be tried.

Orthopsis is of little help, for one can build up the amplitude of convergence in the near range to a very high degree without influencing the excessive action of the divergence muscles in the distance.

Prisms base in may be tried.

type of patient with symptoms of eye strain, that

Group V

ORTHOPHORIA WITH SYMPTOMS

Muscle balance at 33 cm orthophoria at 6 meters orthophoria

Muscle strength: Abduction $\frac{R\ 2}{L\ 2}$ deficient action Adduction $\frac{R\ 2}{L\ 2}$ deficient action

latent muscle imbalances, either lateral or vertical may be uncovered by resorting to an occlusion test.

Treatment consists in orthopsis to increase the amplitude of convergence.

Prisms base in may be helpful.

resort to eye muscle exercises and it is easier for them to wear glasses with prisms base in.

Before adding prisms to the refractive error because of the muscle imbalance, it is wise whenever possible to have the patient wear trial prisms for two to four weeks, and in that way one will

Group VI

HYPERPHORIA

Muscle balance at 33 cm $\frac{X^4}{RH^4}$	at 6 meters $\frac{\text{orthophoria}}{RH^4}$
Muscle strength: Abduction $\frac{R\ 6}{L\ 6}$ normal action	Adduction $\frac{R\ 14}{L\ 14}$ normal action

The above findings are those of right *hyperphoria.* The mild exophoria at 33cm is of no importance and the ductions are normal.

Treatment consists in prescribing prisms to be worn before the eyes, base down before the right, and base up before the left.

The difficult problems which arise in the evaluations of the muscle imbalances occur in the esophorias and esotropias, who are relatively high myopes, as well as in the exophorias and exotropias who are moderately high hyperopes. In the former group (myopes) the full correction is needed for maximum vision, yet this full correction stimulates the accommodation and convergence which are already excessive. In the moderately high hyperopes, on the other hand, one must provide for the accommodation needs by prescribing generously, and yet stimulate the convergence which is weak. One works his way out of these dilemmas by giving appropriate attention to the physiologic function which seems the greatest in need, be it the accommodation or the convergence.

GENERAL CONSIDERATIONS IN THE TREATMENT OF THE IMBALANCES

In doing routine muscle testing a stereoscope should be readily available so that in the imbalances of high degree or those of low degree with poor ductions the presence of fusion and depth perception can be quickly ascertained. A certain percentage of patients are benefited by orthopsis. The exophorias due to convergence insufficiency (weak adduction) fall into this group. One can build up a large amplitude of convergence to carry a patient along comfortably for many months. Patients as a rule, will not arrive at more accurate conclusions regarding their necessity. In a new patient who has never worn glasses and whose refractive error is negligible but who has a muscle imbalance, I prescribe trial plano prisms for the imbalance. For those who wear glasses with corrections which approximate my findings, I prescribe trial slip over prisms to be worn over their old glasses for a period of time. If they prove helpful, I incorporate the prisms in my findings.

In the prescribing of prisms caution must be exercised regarding the amount used. In the vertical imbalances one prescribes as the total correction divided equally between both eyes — from three-quarters to the full amount uncovered at examination. For example, in four degrees of right hyperphoria prescribe one and one-half to two degrees base down before the right eye and one and one-half to two degrees base up before the left. In the lateral muscle imbalances prisms are helpful only in the exophorias. The same rule as to the amount of prisms needed for the exophorias does not prevail as exists for the vertical imbalances. It has been found clinically that small degrees of prism base in are helpful even in relatively high amounts of exophoria and one need not prescribe more than a total of three to four degrees base in divided equally between both eyes. In moderate exophorias with poor adduction one-half degree prism base in before each eye usually suffices. Prisms in the esophorias are of little avail.

Surgery in high degrees of exophoria due to divergence excess is at times justifiable. If these patients are not benefited with either exercises or prisms a moderate recession of the externi may solve the entire problem.

One must keep in reserve the need for an occlusion test to uncover latent muscle imbalances — vertical or lateral, when the symptoms suggest their presence, though the routine examination fails to disclose such findings.

CONCLUSION

The testing of the accommodation range, muscle balance and ductions should be done routinely on all patients who come with symptoms of eye strain. The symptoms are due to refractive errors, deficiencies of accommodation or muscle imbalances, or a combination of any of the above three factors.

A framework incorporating the above tests can be relatively simple, yet comprehensive and not time consuming.

The final prescription for glasses which incorporates all the findings will be an accurate gauge of the patient's needs.

DISCUSSION

Dr. Earle B. Fowler, Chicago: I think Dr. Halper is to be commended for making this so clear and simple to us. I have only one suggestion to make with reference to the position of the eye in the measurement at 33 cm. This is a modification that was suggested to me originally by Dr. Thomas Allen. Most of our work, our close work is done with the eye looking in a downward direction. Therefore, he has advocated, and I have copied, putting a small split prism into the bottom of the trial frame disc so that the patient is looking downward for the test.

We should not draw conclusions as to diagnosis until we have at hand all the information it is possible to obtain. Dr. Halper has certainly given an outline of the minimum of study. It is interesting that in this branch of ophthalmology our methods are less standardized than in any other branch, so each of us must adopt the method best suited to his individual routine. The more we study these muscle imbalances the more patients we are going to make comfortable. The deficiency of muscle action may not lie entirely within the eye structure itself. A reduced amount of nervous energy that is available for this functional use may be responsible. We must study the patient's general physical condition when abnormalities are found because therein often lies the answer.

After I read Dr. Halper's paper I questioned a number of men rather boldly as to their training and present work in refraction, and I feel very sure that hospitals that are developing courses in training residents, societies — both national and local — that are developing courses of study, and universities that are developing graduate courses should stress the study of the physiology of the eye as applied to refraction so that young men will have a thorough working foundation.

Dr. George Guibor, Chicago: I think we owe Dr. Halper considerable for bringing to our attention the subject of refraction in relation to divergence and convergence anomalies. May I suggest, however, that some of the terminology used is wrong physiologically. Abduction and adduction are terms used to discuss monocular motility. When we talk about prism adduction we are really talking about convergence; when we talk about abduction we are really talking about divergence. I do not believe that we can measure any individual muscle of the eye by placing prisms before the eyes. There is only one exact test, in my experience, that will break up binocular vision completely. That test is the screen test. We determine a heterophoria subjectively by using the Maddox Rod, but we cannot do it exactly unless we combine it with the screen test. I have used the Maddox Rod on over two thousand patients, comparing this test with the screen test, and the only test that produces a true fusion free position (heterophoria) is the screen test. In determining a so-called duction a great variation occurs in the findings with prisms. At times an excellent convergence is present, and at other times a weak convergence depending on the fixation object and degree of fatiguability of the patient. I have measured my own divergence and convergence power by prisms many times. The measurements are quite variable, yet I am quite comfortable. I have an exophoria of 13 prism diopters for near, and a left hyperphoria of 5 prism diopters for near. The prism rules given would be to use prisms for this hyperphoria, two-thirds or three-fourths of the total amount of this vertical deviation. I am comfortable, so why develop a permanent deviation by using prisms in my case. This rule of using prisms should depend, therefore, upon the complaints and symptoms of the patient and not upon any other rules. So-called duction tests and tests for heterphoria should be tried in the morning and again in the evening because of the varying ability to overcome prisms. A normal screen test in the morning may be very different in the evening, and show an abnormal deviation upon second testing.

In conclusion, I think we should thank Dr. Halper for bringing to our attention that prescribing lenses does not include merely the prescribing of lenses for vision alone, but includes also a determination of the status of the extra-ocular motility and its improvement by appropriate decentration of lenses or the incorporation of prisms if the complaints of a patient necessitate such procedures.

Dr. George Park, Chicago: I would like to ask Dr. Halper one question. His procedure as I understand it is that he requires that each eye be tested for adduction. I believe he used the word individually or separately. As I understand it, while testing ductions you are testing both eyes at the same time, so I wish he would clarify that.

Another thing I would like to bring out for discussion is the fact that almost invariably anyone doing orthoptic training tries to get exactness in muscle measurements. They forget that the muscles of the

eye are no different from other muscles, and knowing what we do about the variability and changeability of other muscles it would be highly improbable that the muscles of the eye would differ in any respect. That is one criticism I would have of the treatment, measurement and procedure brought about in orthoptic training, and I wish he would discuss the physiologic variability as compared with other exacting procedures that have been established.

Dr. Philip Halper (closing): So far as my vocabulary is concerned one needs only to read Stutterheim's book on "Eyestrain and Convergence" to realize that medical vocabulary is constantly changing. A workable concept in the physiology of the intra and extra ocular muscles is more important than a play on words and definitions. I have tried to eliminate mathematics and complicated optics.

In doing a refraction one cannot have a patient make repeated visits for muscle determinations merely because the figures may vary one or two degrees from day to day. Basal metabolism, intraocular tension and blood pressure are physiologic processes which also vary within normal variations from time to time, but patients are definitely classified within these normal variations. Were it not so, normal findings within certain ranges would cease to exist and one would check and recheck until the patient himself would object to such procedures.

Within certain obtained figures all patients can be classified regarding their binocularism in any of the six groupings listed in the body of the paper. A patient usually shows the same figures in the muscle balance and muscle strengths from year to year. Even with the wearing of prisms base in for convergence insufficiency the abduction and adduction findings remain relatively the same from year to year, contrary to the belief of some that with base in prisms the adduction is further weakened. The wearing of base in prisms merely gives the patient comfort while he uses his eyes, though the convergence insufficiency remains the same. Orthopsis should, of course, be used in such a case to build up a large adduction reserve.

From the standpoint of teaching simplification is always the desired goal. No branch of ophthalmology seems to be in greater need of simplification and understanding than the entire field of muscles, the heterophorias as well as the heterotropias. The latter have been emphasized so much in this past decade that the phorias have not received the attention which they justly deserve in the entire picture of refraction.

THE TREATMENT OF BURNS

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Methods and medicaments employed in the treatment of burns are as varied and numerous as those used in the treatment of arthritis. The presence of such variability indicates that surgeons have not yet found the all acceptable method.

Hippocrates in 430 B.C. recommended the use of old swine seam mixed with resin and bitumen, warmed by fire and bandaged to the burned area. Aristotle suggested that the burned or scalded area be exposed to the heat of fire. The application of dressings saturated with salt solution and applied directly to the burned area was thought to be proper treatment in the middle 1800's. Until a few years ago Carron oil had been used in the first aid treatment and as the treatment of choice in burns of varying degree. Davidson of Detroit popularized and expounded the 5% tannic acid spray treatment. This method had been used by the author but was found wanting in deep second and third degree burns in which it was impossible to tan deeply enough. It was usual to find a mass of sloughing, infected tissue under the tanned crusts that necessitated removal of the eschar. This in itself is quite a painful procedure.

For the purpose of correlating our thoughts the burn classification of Boyer which divides burns in three degrees based on depth, will be used. A first degree burn is characterized by superficial changes in the skin which consist of an erythema of varying intensities. A second degree burn is one in which all changes in the burned area are superficial but may include the entire epidermis and be associated with bleb formation. In a third degree burn the pathology extends through the skin and into the subcutaneous tissue and may involve muscle, tendon or bone. It is important to bear in mind that occasionally Duputryns' burn classification of six degrees is used at our Industrial Board hearings and it behooves us to ascertain the classification used when the opposition mentions second or third degree burns.

The ideal burn treatment is one that will most nearly fulfill the following prerequisites, namely — relieve pain, prevent excessive loss of body fluids, prevent or reduce absorption of toxins, hasten solution or separation of dead tissues, prevent or minimize surface infections, promote and enhance healing, protect damaged epithe-

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Read before the Surgical Section, Illinois State Medical Society, May 21, 1940, Peoria.

lium, prevent injury to the delicate growing epithelium, and minimize scar tissue formation.

The systemic or supportive treatment of individuals with extensive second or third degree burns is extremely important and one should not allow the local treatment to overshadow it. General treatment consists of the immediate administration of sufficient morphine to relieve pain. Maintenance of body temperature by the application of warmed blankets, electric pads, hot water bottles and treatment in a warm room. The administration of 3 to 4 thousand cc. of fluids intravenously or by hypodermoclysis, irrespective of oral ingestion, each 24 hours during the period of toxemia. 1000 cc. of 5% dextrose in saline alternated with a like amount of Hartman's solution has proven very satisfactory in my hands. Adrenal cortex intravenously is valuable in maintaining the vascular tone.

Underhill and his coworkers have shown that there is a marked increase in the blood concentrations in extensively burned individuals by the marked elevation in hemoglobin percentage, also that the sodium chloride content of the blood is greatly reduced during the stage of blood concentration and remains so until the slough separates and then rises to normal with a corresponding increase in urinary chlorides. Locke found a sluggish flow and dark purplish appearance of the blood with an immediate increase of from one to four million red blood cells, a rapidly increasing leukocytosis to between 30 and 50 thousand and a marked increase in the blood platelets. Blood transfusions have not been resorted to but are of great value in specific cases. A diet high in calories and rich in vitamins should be ingested during and following the toxic state. Tetanus antitoxin in a prophylactic amount should be administered in all severe sloughing burns.

In industrial work I have found that the most satisfactory local treatment of extensive burns is a modification of the "Ambrine" technique. The originator of the "Ambrine" treatment was Barthe de Sandforte, a Frenchman, who in 1914 employed it in the treatment of burns received in combat. Dr. William O'Neil Sherman observed the "Ambrine" treatment and was impressed by the results obtained and introduced it to the United States in 1916. In 1918 he reported a series of 3,000 cases in the *Journal of Surgery, Gynecology and Obstetrics,* treated by this method. "Ambrine" is an expensive proprietary wax with a chemical analysis of 92% paraffin and a remaining 8% of olive oil, beta-naphthol and oil of eucalyptus. Because of the expensiveness of "Ambrine" Dr. Sherman substituted a paraffn with a low melting point, good ductility and flexibility and obtained identical results.

The apparatus and materials required in this wax treatment of burns are inexpensive and easily obtained. The wax itself is a Standard Oil product called parawax and may be purchased in any grocery store. A very ductile paraffin known as Stanolind has been used and was found to be very satisfactory. This paraffin is melted in an ordinary household double boiler such as used in the preparation of rice or other cereal. Some of the melted wax is poured in a water jacket atomizer designed by Sherman and manufactured by H. R. Pierce Company, operated by a hand bulb or an electric air pump. This atomizer consists of two cylindrical metal containers. The smaller inner one fits into the outer cylinder. A space between the walls of these two containers is filled with hot water. This maintains the paraffin in a liquid state and prevents the wax from congealing at the outlet. There are two small openings in the rim of the inner cylinder. One is for the escape of the paraffin spray and the other is an inlet for air. A hollow metal tube is connected to the air inlet and affords an ingress of air into the wax chamber during operation of the atomizer. An ordinary electric fan or warm air hair dryer, Shelton type is used to dry the burned surface. A brush with soft bristles such as those made with camels hair, thin stripped sterile sheet wadding or a special cotton known as "Redintol," and finally absorbent or cellucotton.

In preparing the burn for wax therapy the skin immediately surrounding the burned area is shaved and cleansed with soap and sterile water and dried with ether. Foreign material such as clothing, dirt, tar, metal, etc. is removed with sterile forceps. All dried clumped areas of skin are excised with sterile scissors. Blebs should be incised and drained but the overlying epidermis allowed to remain in place. It is not essential to do a complete debridement at the initial dressing because the burn is dressed daily and debridement may be carried out under more satisfactory conditions at that time. Ether on cotton swabs may be used to remove grease or

oil. It will be a welcome surprise to surgeons dealing with tar burns who are familiar with the tenacity with which it clings to the tissues to know that the tar remaining at the burn site is impregnated in the wax dressing upon removal the following day. If considerable pain is present an intravenous or inhalant anesthetic may be given. In burns caused by a thermic agent it is not necessary to paint the wound with antiseptics because the causative agent has already done a splendid job of sterilization.

After the burn has been properly prepared, its surface is dried by fanning or by employing a warm air hair dryer. Then, either with a hand or power atomizer a thin layer of melted paraffin is sprayed over the burned area. The spraying is begun at a distance of two feet so as to decrease the sting of the warm atomized particles on the raw surface and gradually as a protective coating of wax is built up the operator brings the atomizer closer and closer until a heavy coating of paraffin is obtained. Pain is relieved as soon as sufficient wax has been sprayed on the burn to protect the exposed nerve endings and shut out the circulating air currents. The speed and ease with which this protective layer is secured is one of the reasons I have come to like the paraffin treatment of burns so much.

After a primary coat of paraffin of sufficient thickness has been laid down a very thin layer of sterile cotton is spread over the wax. Sterile forceps are used to handle the cotton. This sterile cotton is usually made up into sheets 6"x8" and care must be taken to avoid wrinkling or overlapping of the edges. This matrix of cotton increases the elasticity of the wax, prevents cracking of the paraffin and also serves as a foundation upon which to paint the second layer of the dressing. Then with a camels hair brush a second layer of paraffin is painted over the smooth cotton. This second paraffin coat should be quite heavy, approximately twice the thickness of the primary layer. Test the temperature of the paraffin on the brush which is to be used for the painting before applying it because it is extremely easy to add to the burn of your patient at this stage of the procedure by using paraffin that is too hot. Remember too, that this burn is extremely sensitive and temperatures that feel just warm on a normal skin may feel quite hot to the patient. The dressing is now concluded by covering the wax with a thick layer of absorbent cotton which is either strapped or bandaged in place. The cotton helps to keep the part warm, absorbs secretions, and maintains the flexibility of the paraffin.

These burns must be dressed daily and herein lies the chief advantage of this treatment. The surgeon sees daily what progress is being made and has complete knowledge of what is going on at all times. The dressings strip off smoothly, easily, and painlessly leaving the area covered with a serous discharge. This secretion is removed by gentle sponging or irrigating with a 0.5% sodium hypochlorite solution. Any new formed blebs or sloughing tissue that has loosened is debrided being careful to prevent bleeding. When the wound is sufficiently cleansed, it is dried and the wax reapplied.

Occasionally in third degree burns that become foul smelling with profuse drainage it is necessary to irrigate the area for 2 or 3 days with 0.5% sodium hypochlorite solution (Dakin's solution) until the slough has separated and then continue with the paraffin treatment.

In extensive third degree burns where skin grafting might be indicated it is well to graft early. That is, as soon as healthy granulation tissues have formed and the wound does not contain more than 1-2 bacteria per microscopic field. Dakin dressings should be applied to the granulating surface until two days prior to skin grafting.

The paraffin wax treatment is especially satisfactory in the treatment of burns in children. The immediate relief of pain, the noise of the air, and motor and the appearance of the fine powdery "snow" fascinates them. The screaming struggling child is replaced by a very attentive smiling youngster who is happy to see his doctor every day.

In conclusion the advantages of the paraffin wax treatment of burns as proven by experience are: 1. Pain is relieved immediately or within 24 hours; 2. The period of toxemia is lessened; 3. Infection is minimized; 4. Slough separates early; 5. Healing is rapid; 6. New formed epithelium is not injured upon removal of dressings; 7. The dressing is comfortable to the patient; 8. Cicatricial formation is at a minimum; 9. Excessive granulation tissue is unknown; 10. Patient is made ambulatory early; 11. The attending surgeon is always aware of the condition of the burn.

REFERENCES

Journal of Surgery, Gynecology and Obstetrics, 1918, 26: 450-459.

DISCUSSION

Dr. Sumner Koch, Chicago: Dr. Zeiss' paper is a splendid presentation of what can be accomplished in the treatment of burns, and if I were to take exception to the exact method of procedure it would be only with the hope of helping him to improve just a little on what is a splendid job.

I would like to stress even more than he did that our first problem in the treatment of burns is to cleanse the burned area as completely as possible and to convert the open wound into a clean wound by careful soap and water cleansing. Dr. Zeiss has shown you that when this wound has been cleansed it can be converted into a closed wound, and this seems to us a very important surgical principle.

In caring for the patient after the initial treatment I cannot see the necessity for removing the dressing within two, three or four days unless there is some definite indication for its removal, such as rise of temperature or evidence of infection. A burned area that we have been able to cleanse satisfactorily is like a donor site from which we have removed a portion of skin. When we cut away two-thirds of the thickness of the skin and transplant it elsewhere, we cover the raw surface with gauze impregnated with vaseline. Over this is placed a large fluffed dressing of sterile gauze; the part is immobilized with a splint and left alone. At the end of ten or twelve days the dressing can be removed and if the whole thickness of the skin has not been removed one should find a completely healed surface underneath it.

I would suggest that when one has been able to clease burned areas satisfactorily, instead of taking the dressing off at the end of twenty-four hours it be left for ten or twelve days or more, unless there is pain, temperature, or other symptoms indicating infection under the dressing. I venture to say Dr. Zeiss will find many of his cases are healed at the end of ten or twelve days without further treatment.

I would like to add in connection with these hands which he treated so nicely that if he will add an aluminum splint to immobilize the hand it will help to provide the rest which is an important factor in hastening healing, whether the injury is superficial or deep.

Dr. Phillip Kreuscher, Chicago: I have watched this work as presented by Dr. Zeiss with a great deal of interest, over a period of three and a half years. We use it in both of our plants and claim no originality since this work was done during and immediately after the first world war. Some of us have gotten away from this treatment not so much that we were dissatisfied with the results, but because of the fact that it required a little more work on the part of the nurses and the doctors. From time to time we were told that one could use tannic acid and other medicaments, and that by putting these on without any care or effort, the burn would heal. Some of them healed, some did not, and too often they healed with considerable scarring.

I was glad to hear what Dr. Koch had to say concerning the matter of dressings. The reason we change them early and fairly frequently is because most of the burns we get in the mills are fairly deep, at least in spots. Some have first degree areas, some second and others have deep grooves burned into the tissues, very much like the boy whose picture Dr. Zeiss showed you and who had a large rail fall on his back. In such cases I doubt that a prolonged dressing would keep the wound clean and uncomplicated.

This method is not a complicated one, nor are the appliances used expensive. The atomizer and the dryer cost very little and we believe that we have now so simplified the technique that it is not in any way a complicated procedure since our junior surgeons and nurses do this without any trouble.

I think Dr. Koch is correct in emphasizing the application of pressure bandages. You saw how these dressings were covered with gauze and wax and then bound on firmly.

Those of us who see these cases every day are convinced that we have no reason for changing to any other method of treatment. It has given us such excellent results; results which we were unable to obtain by any other method. The patients are relieved of pain and we get early primary healing in most cases, in the more severe ones very little of scar tissue formation. Many of our patients who have been treated by other methods and have since then been treated with the wax method, are the best judges. They agree that the dressings are painless, that they are very comfortable almost immediately after dressings are applied, and I think our results as cited by Dr. Zeiss and as shown in the moving picture film, point to the efficiency of the treatment.

Dr. Frederick Christopher: I have a dismal feeling that this paper seems to sound the death knell of the coagulant treatment of burns. I cannot quite agree with that. One of the most vivid memories in my mind is the care of burned children in a New York hospital twenty-five years ago. Changing the dressings was dreaded by the children and by those who took care of them and it was a real ordeal for both.

The work of Montgomery and Penberthy on such cases is a marked contrast. We are all in agreement that it is desirable to convert these wounds into clean closed wounds. This is difficult to do. If it is possible to cleanse the wound with particular care at the time of injury, then it is desirable to convert it into a closed wound by means of coagulant. I think we have all seen children with the body badly burned, who when this has been done, will play about in a heated tent.

With reference to fluid loss, I believe the coagulant is a greater preventive of fluid loss than other treatment. If the hemoglobin goes to 140 it is usually the end of the patient.

Dr. Zeiss showed beautifully a picture of motion of the arm and exercises to prevent contractions. I would venture to suggest that the contracture is determined by the depth of the wound. There is nothing we can do to prevent it, and we might as well put the arm up and confess defeat. We will have to do a later operation and excise it. The depth of the burn determines the extent of the contractures.

I have found Aldrich's dye very efficacious if there are organisms in the wound, as a germicide against gram negative as well as gram positive organisms.

I have enjoyed this paper and congratulate Dr. Zeiss. It is a contribution to burn therapy. However, I would hate to see the coagulants thrown by the board.

Dr. Chester R. Zeiss, Chicago (closing): I wish to thank all the discussors. In answer to Dr. Koch, about keeping the dressings on for ten or twelve days I may say that in following the first or second degree burns through I agree with him that we could keep these dressings on for an indefinite period of time. However, in our third degree burns, in which the burn extends into the subcutaneous tissue or bone, I always like to look at the burn daily so that I may excise the sloughing tissue as it loosens. That cannot be done in one day. You will find that in watching these burns there will be areas you may pick up with sterile forceps. You cut through these and find they are completely separated from the underlying tissue. In that type of burn if we allowed the dressing to remain on for a period of twelve days we would have a very sick patient. It would be similar to the tannic acid crust if used in third degree burns.

With reference to the contractures of the shoulder; these men are usually put up in some kind of apparatus to keep the burned area stretched and allow the formation of epithelium on the stretched surface. In the use of Dakin's solution we know that occasionally these men complain of smarting. When this occurs it is perfectly legitimate to reduce the solution to half strength and eliminate the smarting.

CLINICAL APPLICATION AND RESULTS OF PYRIDIUM THERAPY

J. S. Reynolds, M. D.
J. L. Wilkey, M. D.
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COOK COUNTY HOSPITAL

During the past ten years, there have appeared in medical literature many clinical reports on a remedy used in the therapy of urogenital infections, the chemical nature of which is phenylazo-alpha-alpha-diamino-pyridine monohydrochloride and which is offered under the trade name "pyridium." The testimony of the literature leads to the conviction that pyridium is of decided clinical value in many inflammatory conditions of the genito-urinary tract.

Although we may accept the fact that pyridium does not meet the modern demand for a "urinary antiseptic" — and apparently none of the numerous so-called urinary antiseptics do — the question arises: what is its value as far as other modes of action are concerned? From our observations as outlined herein, pyridium possesses analgesic properties. However, it may also have a "detergent action;" or an "antispasmodic action;" or it may stimulate healing; or it may have a "local antiseptic action" which is destroyed in exerting its effect.*

The therapeutic effect may be rendered through the conversion of pyridium to some other substance which may be called an "educt" and exerted in the process of the educt production from pyridium. On the other hand, the therapeutic effect may be due to the presence of the "educt" itself. In this case, the effect would be proportional to the concentration of the product.

With the above in mind, experiments are now being conducted to secure the "educt" in concentrated form and then to discover how this substance can be made to reach the seat of the affection in order to increase its efficacy. This may be of great practical importance since such investigation may lead to the discovery of the fate of pyridium in the system and trace, as far as possible, the intermediate substances produced from it on its travel through the body. There may also be determined to what extent the pharmacologic action of the various intermediate products, especially the unstable ones, may be of therapeutic value. As a result we may finally be enabled to use for therapeutic purposes a product which, because of its character,* could be administered in larger doses or concentrations and, hence, produce better results.

Because of certain differences of opinion not only as to the mode of action but also as to the type of cases in which pyridium is primarily indicated, and the degree of symptomatic re-

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From the Urologic Services of Drs. Harry Culver, Leslie L. Veseen, Harry C. Rolnick, and Dorrin F. Rudnick, and the Department of Therapeutics, Director, Dr. Bernard Fantus.

*Work to prove or disprove these latter actions is now going on and will be reported at a future date.

*As the educt is supposedly a substance presenting the end-result of pyridium metabolism it should obviously be "detoxified."

lief following oral administration, it was thought pertinent to initiate a clinical investigation of these factors, which should run parallel with the above mentioned experimental work.

As we had ample facilities and indications for the administration of pyridium, it was given to patients whose pathological findings represented almost every common urologic lesion encountered in a large number of hospital and clinic admissions. No attempt was made to study the bacteriology of these cases. However, the clinical progress during pyridium therapy was carefully checked, with the objective of again evaluating the definite effect of the drug which has established its effectiveness for symptomatic relief.

Authors differ as to the particular uropathy in which pyridium is most effective. Various authors[1,2,3] obtained excellent results in prostatitis, cystitis,[4] specific urethritis[5,6,7,8,9] and pyelonephritis[10,11,12,7] respectively. However, throughout the published literature on pyridium, there appears emphasis on its effectiveness when administered perorally for the production of prompt symptomatic relief of the syndrome of distressing symptoms such as pollakiuria, dysuria, and various types of associated pain.

PROCEDURE

Our group of cases includes obstructive and inflammatory uropathies of all types.

We started our studies with a group of patients whose pathological changes necessitated hospitalization. In these cases, a twenty-four hour total urine output was collected. This was subjected to the usual complete urinalysis. Pyridium therapy was started on the usual dosage of two pyridium tables (0.1 Gm. each) t.i.d. As long as the pyridium therapy was continued, twenty-four hour urine specimens were collected and careful, complete urinalyses were done on them including determination and extraction of pyridium eliminant.

The second group of patients were those whose findings did not necessitate hospitalization. Voided specimens of urine before, during, and after pyridium therapy were carefully analyzed.

Before pyridium therapy was started, a careful history was taken. While the patient was taking pyridium, his complaints were carefully noted. As the case progressed to relief of symptoms or to failure in our course of treatment, the complaints likewise were recorded. Treatment with pyridium was seldom extended beyond a fourteen-day period. The patients were followed up for a period of several weeks after discontinuance of the drug.

The facilities that have been made available for this study have been employed for the benefit of suitable patients at the Cook County Hospital in order to secure the necessary large quantities of urine and clinical observations required. The pharmacologic studies were conducted at the College of Medicine of the University of Illinois. From the latter will be reported an article on the chemical-pharmacologic studies of pyridium made there. The present article is the result of the clinical studies carried on at the Cook County Hospital.

RESULTS

The results of this study will be discussed according to the following sub-groups:

1. Vesical neck obstructive uropathies
2. Cystitis
3. Pyelonephritis (chronic pyelitis)
4. Chronic prostatitis
5. Urethritis
6. Miscellaneous

(1) *Vesical Neck Obstructive Uropathies.* We started our study on vesical neck obstructions that were being prepared for relief of their obstruction. All these cases complained of nocturia, frequency and in some cases burning on urination. They also had a retention or a residual urine of at least 4 oz. and cystoscopic evidence of obstruction. Improvement or alleviation of symptoms was evidenced by cystoscopy and decrease of residual urine. It is our opinion that in these cases the essential value of pyridium therapy is temporary relief of the secondary symptoms due to the obstruction until the patient's general condition improves sufficiently for the obstruction to be permanently relieved. Pyridium therapy did not sufficiently improve the cystitis or relieve the pain of indwelling urethral catheter to warrant its routine use in this type of case. Among this latter group of cases were those that were prepared by urethral catheter drainage, suprapubic cystotomy preliminary to a later surgical relief of the obstruction. In our series we had 45 cases of vesical neck obstruction. In 19, or 42 per cent of cases, there was a definite relief of the

secondary symptoms (pain, dysuria and nocturia). On the remaining 26 cases, or 58 per cent, no effect on the symptoms could be noted. In this latter group fell almost all cases who had a preliminary surgical interference (cystotomy and indwelling catheter).

(2) *Cystitis.* The most satisfactory result of pyridium therapy was obtained in the patients with cystitis, prostatitis and pyelonephritis.

Altogether, 37 cases of cystitis were observed. These cases complained mainly of burning on urination, frequently and dysuria. Bladder urine cultures or stained sediment slides revealed organisms and pus cells. Improvement included alleviation of complaints and absence of or marked diminution in the amount of pus in the bladder urine sediments.

It was noted that the cases of cystitis uncomplicated by additional urologic components showed the greatest improvement. On the other hand, the group of cystitis cases which in addition had other urologic complaints, e.g. prostatic hypertrophy, vesical calculus, renal calculus and renal infection, seemed to show little or no improvement unless there was a corresponding improvement in the urologic component. In our study, 28 or 80 per cent of the cases had definite improvement while 9, or 20 per cent, showed no changes in their symptoms.

(3) *Pyelonephritis.* Twenty-five cases of chronic pyelonephritis were observed. These complained of costovertebral pain, frequency, nocturia, and in some cases burning on urination. Ureteral urine specimens showed positive cultures and x-ray studies revealed clubbing of the calyces and dilation of the infundibulum of the calyces. Of these cases, 19 or 76 per cent showed improvement on pyridium therapy. This improvement manifested itself by alleviation of symptoms and improvement in the findings of the stained bladder urine sediments. Six, or 24 per cent showed no definite alleviation of their symptoms. We feel that the improvement seen in these cases is undoubtedly due to the analgesic action of pyridium and possibly to a detergent effect.

(4) *Prostatitis.* Fifty-four cases of prostatitis were studied. These complained of perineal, penile, or low-back pain, frequency, nocturia, and burning on urination. The prostatic smears showed at least 40 pus cells per high power field. There was no obstructive uropathy present as evidenced by residual urine. This group of cases was not given any local therapy such as prostatic massage or posterior instillations, other than that necessary to make a diagnosis or check therapy. These cases obtained symptomatic relief of complaints and a diminution in the amount of pus in the prostatic secretion. The relief of burning on urination, frequency and pain was remarkable. We feel that it is in this type of patient that pyridium finds a useful field. The results here, too, must be due to an analgesic action of the pyridium.

(5) *Urethritis.* Fifteen cases of urethritis, both specific and non-specific were observed. Their complaint consisted of burning on urination, dysuria, frequency and urethral discharge. Of these 9, or 60 per cent, showed improvement of their symptoms on pyridium therapy. Six, or 40 per cent, remained unchanged. In the results of this group there was apparently no difference whether the urethritis was specific or non-specific.

(6) *Miscellaneous.* Twelve cases of various other pathologic conditions with associated urologic symptoms were studied as to the result of pyridium therapy. In this group 4, or 33 per cent, showed definite symptomatic relief while 8, or 67 per cent had no apparent result from pyridium therapy, one cannot draw definite conclusions as to the results of the pyridium therapy on the secondary urologic symptoms.

DISCUSSION

To consider pyridium therapy effective, alleviation or complete absence of symptoms had to occur within seven days. If there was no response in fourteen days, pyridium therapy was discontinued. In our series, the following response to symptoms was found (table I).

SURVEY OF SYMPTOMS

Results	Pain	Burning	Dysuria	Frequency	Urgency	Hesitancy	Nocturia	Pyuria	Hematuria
Improved	32	98	28	54	10	17	41	42	7
No Change	15	18	10	38	5	3	35	12	
Increased				7	2		1	1	
TOTAL	47	116	38	99	17	20	77	55	7
	Expressed in Per Cent								
Improved	68.2	84.5	74.0	54.5	59.0	85.0	53.0	76.5	100
No Change	31.8	15.5	26.0	38.4	29.3	15.0	45.5	21.8	
Increased				7.1	11.7		1.5	1.7	

Pain (as used in our tables this refers to

suprapubic, perineal, or penile pain). Forty-seven patients presented this complaint and 68 per cent obtained relief from this symptom.

Burning on urination was complained of by 116 cases; 84 per cent of these obtained relief of symptom. The relief in the majority of cases was dramatic and manifested itself within four days.

Dysuria was complained of by 38 patients; 74 per cent of these stated that the act of urination was free of pain after pyridium therapy.

Frequency of urination was the complaint of 99 patients; 54 per cent of cases obtained relief.

Urgency of urination was complained of by 17 patients; 59 per cent obtained partial or complete relief of symptom.

Hesitancy of urination was complained of by twenty patients; 85 per cent stated that they were relieved by pyridium therapy.

Nocturia was complained of by 77 cases; of which 53 per cent obtained relief from symptoms.

Pyuria. In 76 per cent of 55 cases who complained of pyuria, there was a marked diminution of pus in the urine, or no pus at all, after seven to twelve days of pyridium therapy.

SUMMARY AND CONCLUSIONS

1. 183 cases of various urologic conditions were studied for the effect of pyridium on the presenting symptoms.
2. The series was divided into cases of: (a) obstruction, (b) cystitis, (c) pyelonephritis, (d) prostatitis, (3) urethritis, (f) miscellaneous.
3. The results of pyridium therapy were most marked in order enumerated: (1) cystitis, (2) pyelonephritis, (3) prostatitis, (4) urethritis, (5) obstruction, (6) miscellaneous.
4. Symptomatically, the following subjective symptoms: pain, burning, dysuria, frequency, urgency, hesitancy, nocturia, pyuria, in the order enumerated.
5. Pyridium, therefore, seems to be a very useful therapeutic agent in the treatment of the above uropathies, although, its mode of action is still not completely known.

BIBLIOGRAPHY

1. Mason, L. M.: Pyridium Therapy in Genito-Urinary Disease, Virginia Medical Monthly 58: 190-194, 1931.
2. Rosenthal, B.: Report from Gouverneur Hosp., New York, 1931.
3. Pugh, W. S.: Infections of the Urinary Tract, Prostatic Lesions, Medical Journal and Record February 6, 1929.
4. Courtiss, M.: Report from Mass. Memorial Hospital, Antiseptics-Pyridium in Kidney and Bladder Infections in Pregnancy.
5. Deakin, Rodger: Efficacy of Pyridium in Gonococcal Urethritis, J. of Missouri S.M.A. 28: March, 1931.
6. Wolff, M. B.: A Clinical Study of Pyridium in Urethritis, Ill. Med. Jour. 67: 155, 1935.
7. Wolbrast, A. L.: A Study of a New Dye-Antiseptic in Urinary Infections, International Jour. of Medicine and Surgery, Sept., 1930.
8. Schofield, F. S.: Specific Urethritis Treated with Azo Dye, Penna. Med. J. 36: October, 1932.
9. Parenti, M. J.: Treatment of Gonorrhea with Pyridium, Med. Record 145: 259-260, 1937.
10. Tatum, W. B.: The Use of Pyridium in the Treatment of Genito-Urinary Infections in Women and Children, Med. J. and Record Sept. 7, 1932.
11. Brown, T. K.: The Bacteriological Study of Urinary Infection in Pregnancy and Puerperium with Special Reference to the use of a Urinary Antiseptic, Southern Medical Journal 26: 788-802, 1933.
12. Walther, H. W. E.: Clinical Application of Urinary Antisepsis, The Southern Medical Journal 22: 161-166, 1929.

Practically all tuberculous individuals are Vitamin A deficient, whether as a cause of tuberculosis or an effect is not known. Marked Vitamin A deficiency might indicate that a thorough chest examination is in order if no other cause be found for this deficiency. Vitamin A deficiency is believed to be widespread. R. Harris and J. Harter, Southern Med. Jour., Oct. 1940.

The examination of familial contacts of tuberculin-positive children between the ages of six months and six years, may be a valuable case-finding procedure, since the opportunity for tuberculous infection among very young children is limited to the immediate family circle. Paul Phelps, M.D., et al, Jour. Pediatrics, Oct. 1940.

Coming Meetings

December 10 — Lake County — North Chicago, Abbott Laboratories — 8:00 P.M. Dr. Michael Mason — "Surgery of the Hand."

December 10 — Effingham County — Benwood Hotel, Effingham — 6:30 P.M. Dr. E. L. Dorsett — "Pernicious Vomiting and Nephritic Toxemia — Treatment of Pre-Eclamptic Toxemia and Eclampsia."

December 10 — Knox County — Galesburg — Doctor Henry Buxbaum — "Indications of Therapy of Non-Obstetric Complications of Pregnancy."

December 10 — St. Francis Hospital Staff Meeting — Peoria — 8:00 P.M. Doctor W. H. Brown — "Prolonged Labor."

December 10 — DeKalb County — St. Mary's Hospital — De Kalb — 6:00 P.M. Doctor George de Tarnowsky — "Carcinoma of the Breast."

December 10 — Winnebago County — Rockford.

December 11 — McDonough County — Macomb, Ill. — 6:30 P. M. — Doctor Wm. Dieckmann — Manikin demonstration on "Forceps" also movies.

December 11 — Clinton County — Breese, Ill., Hawley Hotel — 12:30 P.M. Doctor E. Lee Dorsett — "Vaginitis in Pregnancy."

December 12 — Whiteside County — Annual Meeting.

December 13 — Will-Grundy — Joliet, Louis Joliet Hotel — 12:00 — Dr. W. W. Bauer "Health Education and the Medical Profession."

December 18 — Tri County Medical Society — Golconda, Riverview Hotel — 6:30 P.M. Doctor Harry Leichenger — "The Prophylaxis and Treatment of Contagious Diseases in Infancy and Childhood."

December 19 — Fulton County — Canton — Doctor W. C. Beck — "Differential Diagnosis and Treatment of Acute Abdominal Lesions."

December 19 — Stephenson County — Freeport — Doctor N. G. Alcock — "The Value of Urological Findings in the Diagnosis of Abdominal Tumors."

December 20 — Calumet Branch of the Chicago Medical Society — Morgan Park Military Academy — Chicago — 9:00 P.M. Doctor Walter C. Alvarez, Mayo Clinic — "Abdominal Pain."

December 20 — Will Grundy County — Joliet, Louis Joliet Hotel — 12:00 P.M. Election of Officers.

January 3 — Will Grundy County — Joliet, Louis Joliet Hotel — 12:00 P.M. Doctor Harry B. Mock — "Skull Fractures."

January 7 — Vermilion County — Wolford Hotel, Danville — 6:30 P.M.

January 8 — McDonough County — Subject "Syphilis" (movie).

January 10 — Will Grundy County — Joliet, Louis Joliet Hotel — 12:00 P.M. Doctor J. S. Coulter — "Uses & Abuses of Physical Therapy."

January 14 — Lake County — North Chicago, Abbott Laboratories — 8:00 P.M. Doctor B. Barker Beeson — "Treatment of Syphilis in the Adult."

Marriages

Samuel Arthur Purvis, Des Plaines, Ill., to Miss Rae McKnight of Boston, July 13.

Paul L. Singer, Des Moines, Iowa, to Miss Shirley Evelyn Ellis of Hillsdale, Michigan, October 26, in Chicago.

Scottie Jackson Wilson, Urbana, Ill., to Miss Mary Jane Lohman of Minneapolis in July.

Personals

Dr. Rollo K. Packard gave a paper on "Carcinoma of the Colon" before the Fulton County Medical Society on November 14.

Dr. Max Thorek addressed McDonough County Medical Society on "Electrocoagulation of the Gall Bladder," November 13.

Dr. Italo F. Volini gave a paper on "Cardio-Vascular Renal Disease" before the Bureau County Medical Society, November 12.

Dr. Tell Nelson was invited to address the Effingham County Medical Society on November 12, subject "Allergy for the General Practitioner."

Dr. Foster L. McMillan talked to the Iroquois County Medical Society on Regional Enteritis October 29, Watseka, Illinois.

Dr. M. H. Streicher presented a "rectal clinic" at a joint meeting of the Decatur and Macon County Hospital and the Macon County Medical Society in Decatur, November 19.

Dr. C. Leon Wilson gave a series of lectures in obstetrics before the Post-Graduate Seminar on Public Health at Howard University, Washington, D. C. November 3 to 6 inclusive.

Dr. A. J. Roberts, Ottawa, a member of the society over 40 years, was elected coroner for LaSalle County on the Republican ticket.

Dr. Walter C. Alvarez, Rochester, Minn., discussed "Functional Gastrointestinal Disorders" before the Peoria Medical Society, November 12.

Dr. Richard S. Weiss, St. Louis, discussed "Precancerous Lesions of the Skin" before the St. Clair County Medical Society in Belleville, November 6.

Dr. Wayne W. Fox, Evanston, addressed the Christian County Medical Society at Taylorville, October 30, on pneumonia.

Dr. George K. Fenn, Chicago, addressed the Madison County Medical Society in Granite City, November 1, on congestive heart failure.

Dr. Paul A. Campbell, Chicago, discussed "Medical Problems of Combat Aviation" before the La Salle County Medical Society, October 24, at Starved Rock State Park.

The North Shore Branch was addressed, November 5, by Drs. Chevalier L. Jackson, Philadelphia, and Thomas E. Carmody, Denver, on "Tumors of the Bronchi and Lungs" and "Infections of Face and Mouth" respectively.

Dr. John D. Ellis discussed "Lesions of the Back Mistaken for Trauma" before the Chicago Society of Industrial Medicine and Surgery, November 4, and Dr. Frederick A. Jostes, St. Louis, "Evaluation of Manipulative Therapy for Back Conditions."

A symposium on the treatment of pneumonia was presented before the Chicago Medical Society at the Chicago Woman's Club, November 20. Dr. Gerald S. Shibley, Cleveland, discussed "Chemotherapy" and Dr. Italo F. Volini, "Special Serum Therapy."

The Illinois Association for the Crippled met at the Hotel LaSalle, Chicago, November 7-8. Subjects discussed were "What Is the Role of Our Physically Handicapped Youth in America Today?" "The School of Another Chance" (motion picture) and "The Need for a Program for Spastics in Illinois."

Dr. Oliver S. Ormsby will deliver the presidential address before the twenty-fifth annual meeting of the Institute of Medicine of Chicago, December 3, on "Pellagra: Special Reference to Etiology, Cutaneous Manifestations and Treatment."

Dr. John A. Kolmer, Philadelphia, addressed the Chicago Medical Society, November 6, on "The Present Status of Chemotherapy." Discussions of "The Application of Chemotherapy in Medicine" was presented by Drs. Robert W. Keeton, internal medicine; Warren H. Cole, surgery; Russell D. Herrold, urology; Ralph A. Reis, obstetrics, and Franklin J. Corper, pediatrics.

Dr. Harry Leichenger gave a program on "Poliomyelitis" before the Ogle County Medical Society on November 19.

Dr. Earl O. Latimer addressed the Coles-Cumberland County Medical Society at Mattoon on "Anatomic Considerations in the Repair of Inguinal and Femoral Herniae," November 20.

Dr. Adrien Verbrugghen gave a talk on "Neurology for the General Practitioner" before the Will-Grundy County Medical Society at Joliet on November 22.

Dr. Louis W. Schultz was invited to give a paper on Oral and Plastic Surgery before the Annual Councilor Meeting, Wednesday, December 4, at Burlington, Wisconsin.

Dr. Leon Unger read a paper on "The Heart and Bronchial Asthma" before the Cardiac Section of the Hospital General in Mexico City on October 24, 1940; and on "Allergy and Homeopathy" before the Pan-American Homeopathy Congress also in Mexico City on October 16, 1940.

Don C. Sutton discussed "The Interralation Between the Vitamin B Complex and the Anterior Lobe of the Pituitary Gland," before The Southern Medical Association at Louisville, Kentucky, November 14.

Dr. Herbert F. Fenwick, Army Flight Surgeon, at the Chicago Municipal Airport, gave a talk on "Airline Medical Problems" at the Twelfth Annual Convention of the Aero-Medical Association in Memphis, Tennessee. He was elected President of the Associatiion for the coming year. Many prominent flight surgeons from all parts of the United States attended, including several from the British Royal Air Force.

Dr. Benjamin Goldberg, on November 6, at Iowa City, Iowa, addressed the Junior and Senior classes of the University of Iowa Medical School in the morning, on the "Pathogenesis of Pulmonary Tuberculosis," the Iowa State Sanatorium Associatioin in the afternoon on "Medical Education in Tuberculosis," and the Johnson County Medical Society in the evening, at Oakdale, Iowa, on the "Wandering Tubercle Bacilli and Its Reactions in the Human Host."

Physician: Office and living accommodations available on the ground floor of the Surf Hotel, 501 Surf Street, one of Chicago's largest and distinguished residential apartment hotels. One block to Sheridan Road or Diversey bus, requiring only 15 minutes to the loop.

News Notes

—For Sale: Due to recent death of a Kewanee, Illinois Physician I have for sale his office equipment including instruments, library, sectional book cases, furniture and other items. Mrs. W. H. O'Malley, 724 South Tremont St., Kewanee, Illinois.

—Anatomical and medical modeling, charts, drawings, illustrations and scientific moulage promptly and accurately as well as artistically done by skilled, accredited artist. Write Moulagist, ... , care ILLINOIS MEDICAL JOURNAL, 6221 Kenmore Avenue.

—Medical Research conductors, library research, assistance with manuscripts, translations. Prompt, neat, accurate work by experienced, qualified women. Rates reasonable. Eleanor Senn, 537 W. Melrose, Chicago, Ill.

—The Chicago Surgical Society was addressed, November 1, by Drs. Stephen A. Zieman on "Fibrosarcoma of the Soft Part of the Finger: Case Report"; Paul B. Magnuson, "Joint Débridement: Surgical Treatment of Certain Types of Arthritis," and Geza de Takats, "Surgical Approach to Hypertension."

—The Sangamon County Medical Society gave a dinner in honor of Dr. James A. Day, Springfield, October 3, to observe his completion of

fifty years in the practice of medicine. He was made a member of the Fifty Year Club of the state medical society.

—The Illinois State Medical Society sponsored a postgraduate course in Mattoon, November 7, with the Coles-Cumberland County Medical Society acting as host.

A symposium on diseases of the biliary tract was presented in the evening by Drs. Manuel E. Lichtenstein and Karl A. Meyer, both of Chicago.

A conference was conducted in Bloomington, October 31, with the McLean County Medical Society acting as host and with the following speakers on the program:

Dr. James E. Graham, Springfield, Varicose Veins.

Dr. Wilber E. Post, Chicago, Arthritis.

Dr. Bert I. Beverly, Chicago, General Principles of Behavior in Children.

Dr. Henry Close Hesseltine, Chicago, Newer Endocrines in Gynecology.

Dr. Ralph A. Reis, Chicago, Spontaneous Abortions.

A symposium on the gallbladder and liver, with Drs. Andrew C. Ivy and Harry M. Richter, Chicago, as the speakers, concluded the session.

—The Chicago Society of Internal Medicine was addressed, November 25, by Drs. Fred W. Preston and Willard O. Thompson on "Persistence and Recurrence of Toxic Goiter Following Subtotal Thyroidectomy"; Raphael Isaacs, Ann Arbor, Mich., "Red Blood Cell Size as an Aid in Diagnosis, Prognosis and Treatment," and Italo F. Volini, Robert O. Levitt and Hugh B. O'Neil, "Sulfathiazole in the Treatment of Pneumococcus Pneumonia with a Comparative Study Utilizing Sulfapyridine Therapy" and "Cutaneous and Conjunctival Manifestations of Sulfathiazole Intoxication."

—The Institute of Medicine of Chicago announces that the Elizabeth McCormick Child Research Grant of $1,500 for 1940-1941 has been divided among Drs. Mila I. Pierce, Evanston, Clayton J. Lundy and Heyworth N. Sanford for the continuation of the investigations begun under their 1939-1940 grants. Dr. Lundy's subject is heart sound records in rheumatic heart disease; Dr. Pierce's, leukosis, and Dr. Sanford's, role of qualitative platelet factors in the coagulation of the blood.

—The Sisters of St. Anthony de Padua Hospital gave a dinner, October 9, in honor of four physicians who have given the hospital more than thirty-five years' continuous service. The physicians are Drs. Stephen E. Donlon and Max A. Weisskopf, who have been members of the staff since its foundation in 1896, and Drs. John D. McGregor and Fred J. E. Ehrmann.

—The Tri-County Medical Society, comprising Warren, Knox and Henry counties, met in Monmouth, November 1, with the following speakers: Drs. Charles E. Galloway, Evanston, on "Diseases of the Cervix and Treatment"; Chauncey C. Maher, "Treatment of Cardiac Edema"; Philip Lewin, "Infantile Paralysis," and Morris Fishbein, "The Medical Profession Prepares." All are of Chicago.

—The Chicago Academy of Criminology and the Chicago Society for Personality Study held a joint meeting, October 30. The theme of the session was "The Adult Offender."

Harry M. Fisher, judge of Cook County Circuit Court, and Ernst W. Puttkammer, professor of law, University of Chicago, discussed the presentations.

Deaths

NICHOLAS C. BAUMANN, Highland, Ill.; Eclectic Medical Institute, Cincinnati, 1904; member of the Illinois State Medical Society; past president of the Madison County Medical Society; on the staff of St. Joseph Hospital; aged 64; died, October 13, of cerebral hemorrhage.

DALLAS SETH BOLES, Ava, Ill.; Washington University School of Medicine, St. Louis, 1901; member of the Illinois State Medical Society; aged 63; died, September 12, of heart disease.

MAX DOBROW, Chicago Heights, Ill.; Jenner Medical College, Chicago, 1917; for many years city police physician; aged 56; died, September 20, in St. James Hospital of appendicitis.

ALEXANDER DONALD FERGUSON, Chicago; College of Physicians and Surgeons of Chicago, School of Medicine of the University of Illinois, 1912; served during the World War; aged 54; died, October 14, of injuries received when he was struck by an automobile.

WILLIAM F. HALEY, Chicago; Chicago Homeopathic Medical College, 1889; aged 78; died, September 18, in Marion, Ohio, of arteriosclerosis and cerebral thrombosis.

JOHN ADAM KAPPELMAN, Evanston, Ill.; Northwestern University Medical School, Chicago, 1907; served during the World War; aged 60; died, September 23, in St. Francis Hospital of angina pectoris.

WILLIAM H. O'MALLEY, Kewanee, Ill.; College of Physicians and Surgeons of Chicago, 1893; aged 72; died in September of coronary thrombosis.

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